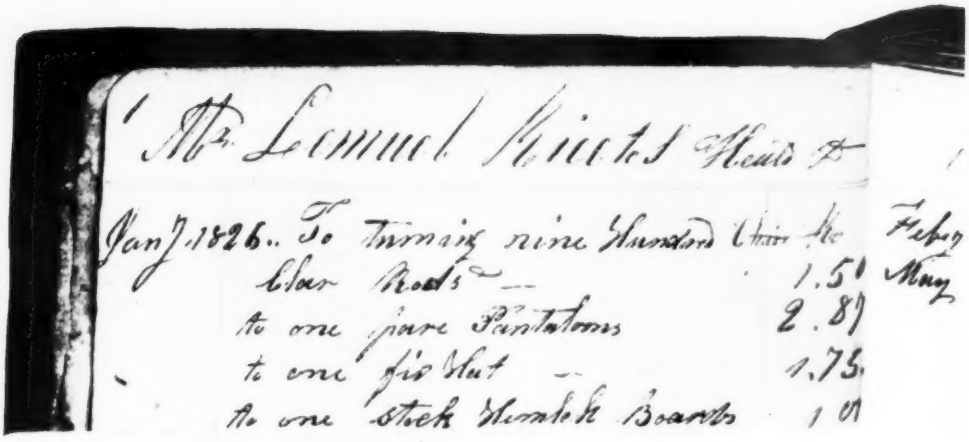
PRICE 50 CENTS

American Machinist

SEPTEMBER 3, 1951

McGRAW HILL MAGAZINE OF METALWORKING PRODUCTION

Precision Builds Power on Wheels – A SPECIAL REPORT


Mr. Lemuel Rice to S. Heald Dr.

Jan 7 1826 To Turning nine Hundred Chair Rods 1.50
Clear Roads —
To one pare Pantaloons 2.87
to one fur Hat — 1.75
To one Stock Hemlock Boards 1 01

YESTERDAY

Mr. Lemuel Rice to S. Heald Dr.

January 7, 1826	*To turning nine hundred chair rods*	*1.50*

This first entry, 125 years ago, in Stephen Heald's ledger marks the beginning of the business of The Heald Machine Company. Farmers for miles around depended on this man's skill and ingenuity for their ox yokes, plow beams and farming tools. He repaired their sleighs, sawed their shingles and ground their grain. He was to be followed by his son, his grandson, and his great grandsons.

Cheese presses, stoves, steam engines — sash trimmers, twist drill grinders and tool post attachments — the products changed through the years but serving the needs of the community continued.

Soon after 1900 the precision-production requirements of the automobile industry were foreseen. The Piston Ring Grinder, Cylinder Grinder and the Internal Grinder have become known the world over as distinctively "Heald." Later noteworthy developments included hydraulic table drives, automatic size control and the Bore-Matic line of precision finishing machines.

HEALD
125 YEARS

TODAY

Commerce, transportation, communication — food, clothing and shelter — all that pertains to our modern way of living depends on machine tools. They have made possible mass production and higher standards of living. Today Heald offers its best in machines and service.

TOMORROW

The record of Tomorrow awaits the future. Our Company is proud to be 125 years old. However, we know what really counts is what we will do with our background for Tomorrow. This is the beginning — not the end — of our greatest opportunity. With a deep sense of responsibility and an earnest desire to be found worthy, we face forward with confidence towards Tomorrow.

THE HEALD MACHINE COMPANY
WORCESTER 6, MASSACHUSETTS

American Machinist

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Chips and QUIPS

UP . . . Our cover watercolor, by the well-known painter of locomotives and trains, Howard Fogg, is a new and previously unpublished picture of a recently completed diesel-electric locomotive for the Union Pacific Railroad. The original was a loan from American Locomotive Company. We reproduce it as a headpiece to introduce our double-length Special Report in this issue.

The Report itself is an unusual one in that it is entirely pictures and captions—something over a hundred units selected from thousands of operations. It is the result of detailed inspections of processes in the buildings of the Alco plant in Schenectady, N. Y., and of the Erie, Pa., plant of General Electric. Two editors were permitted to go freely through the half-dozen or so buildings at each plant most directly involved in locomotive manufacture, and to select in them the processes that we deemed most unusual and broadly applicable in Metalworking generally. While the editors gathered caption material, Jim Burns took photographs exclusively for this Report.

The result is 32 pages of talented tooling that are jam-packed with ideas for you, with explanatory material carefully checked by specialists in the subject plants. It is a graphic story of key operations, made possible only by extraordinary cooperation by production personnel in two large companies.

We have handled it as we did our Turbojet Report of Feb. 5, that has become almost a manufacturing handbook on the subject, except that this time there's no text except the captions. That's to conserve your reading time—to convey ideas as rapidly as possible.

Tooling . . . In addition to the hundred and more tooling shots in our Special Report, there's a spread of good ideas in Talented Tooling, told in picture language, that may give you some suggestions to be applied in your own plant.

Induction Soldering . . . E. M. Wharff of Westinghouse (see biog) has put together for you descriptions of the types of joints best suited to induction soldering. He goes on to point out that, while radio-frequency induction heating won't solve every soldering problem, it can reduce costs substantially on high-production work when properly applied. He points out some of the factors to be considered.

Air Pressure . . . When pneumatic tools and air-powered equipment don't operate as they should, the trouble is probably low air pressure. But it may not be assessable to the compressor; there are other causes and there may be other cures. Edmund Powers lists the things to check before you decide to buy a new compressor.

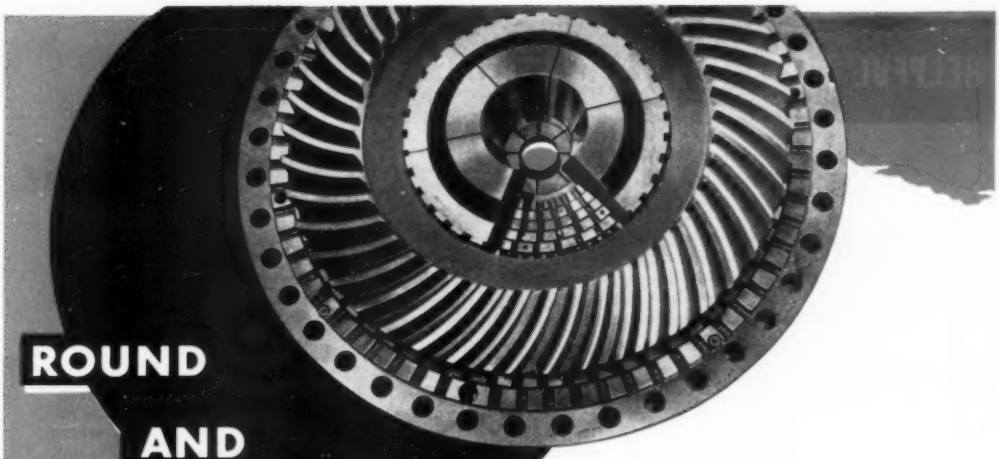
More Support . . . Riverside (N. J.) Metals Co. reinforced its old floors to gain strength. In four pictures, we show how a steel gridwork bridge transfers load to the main building columns and "beefs up" the carrying capacity of the building.

Supervisors . . . How International Harvester quells the common complaint that first-line supervisors are inadequate is the subject of a 2-page story. They train their own, to their own standards, to make sure their foremen will be able to handle their departments right. Thus, IH gets line foremen who are as tried and proven as their capital equipment. E. H. Reed, manager of Harvester's education and training dep't tells the story.

Coming . . . Sept. 17 *AM* will include a Special Report on methods of inspection of engine elements at Chrysler, plus the second installment of the Shaw-Smith series on machining, an excellent compilation on ways to increase output, a short on blanking with rubber, an article on an automatic tube workloader that feeds a shotblaster, and one on rotary broaches. The cover will picture an unusual surface-grinding fixture.

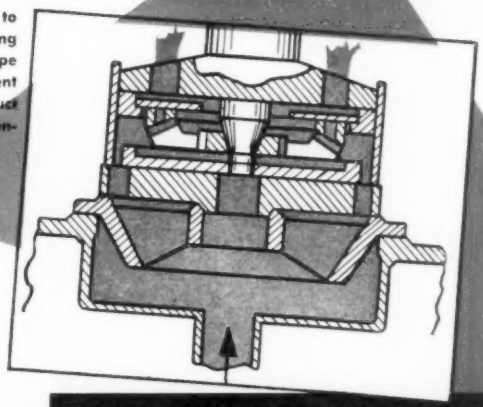
INDUCTION HEATER . . . E. M. Wharff has been with Westinghoue for 10 years; as a manufacturing engineer in the Metals Joining department for four, and as an induction-heating design engineer for the last six. He has produced three completed patents, and has another 20 pending. Earlier experience included work as an industrial X-ray technician and as a salesman. He attended Massachusetts Institute of Technology and Wesleyan University, and has an AB degree.

Mr. Wharff operates a 35-acre farm outside of Baltimore, in addition to his induction-heating work. He is a member of ASM.



ROUND AND TRUE *with* DISTORTION-FREE QUENCHING

When hardening of metal parts is required, the first thought is to prevent distortion. Gleason quenching presses hold parts being quenched between dies which maintain the original shape throughout a metallurgically correct oil flow. This die equipment conforms to the actual shape of the part, and does not obstruct free oil flow over and around the part. It maintains true concentric shape of the part during the entire quench.



Timing cycle begins and quenching oil is forced into quenching chamber and around gear. Quantity and time cycle are under positive control during complete quenching cycle.

In the Gleason No. 36 Quenching Press parts up to 36" may be hardened. Among the many advantages which the 36" Press provides are:

- Controlled quenching at faster and safer production
- Simplified set-ups
- Metallurgically correct oil flow
- Safer loading
- Quenching without distortion

Write for literature. Send in prints of parts to be quenched for our recommendations.

BUILDERS OF BEVEL GEAR MACHINERY · GLEASON · FOR OVER EIGHTY-FIVE YEARS

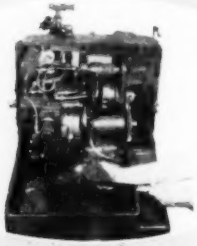
GLEASON WORKS

1000 UNIVERSITY AVENUE · ROCHESTER 3, NEW YORK

HELPFUL HINTS FOR LONG SERVICE

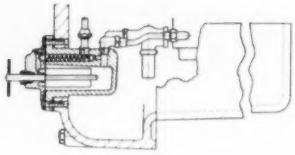
from your Cincinnati Hydromatic

Many of you want new Hydromatic Milling Machines. It's a good indication of a more efficient metal working industry, for it means that a lot of productively obsolete bed type millers will be replaced with modern equipment. But while waiting for your new Hydromatic, production must continue with the old machines. Here are a few precautions which you can take with new or old CINCINNATI Hydromatic Millers to keep them running efficiently.



Periodic oil change and attention to filter would have prevented this condition which necessitated a major overhaul.

Hydraulic unit valve, fouled up because of neglect to hydraulic system.



Oil filter is built into the hydraulic unit.

HYDRAULIC SYSTEM

Oil is the very life of a hydraulic machine. Use a good quality hydraulic oil. To avoid a major overhaul job, which usually results when the hydraulic unit is neglected like the one shown in the illustration, clean the filter once a month. It's simple and easy to do. Remove filtering element and scrape out sludge once a year.

LUBRICATION

Lubrication of your CINCINNATI Hydromatic is principally automatic, but even so, it cannot be neglected. Follow the recommendations in the instruction book. As a reminder, make a lubrication chart and attach it to your machine.

LEVELING

Keep the machine level. This is especially important with long bed duplex style machines. To facilitate this operation, leveling jacks are built-in on current model machines; leveling blocks can be obtained for older models.

CLEANLINESS

Keep the machine clean. This is important for three critical areas: 1) table ways on bed, particularly older machines without way covers; 2) spindle carrier ways on headstock; 3) area around the table control plunger.

These easy-to-take ounces of prevention will pay well in years of trouble-free, accurate performance by your CINCINNATI Hydromatic.

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

P. S. If you're not acquainted with CINCINNATI Hydromatic Milling Machines, write for catalog No. M-1670 for Plain and Duplex Hydromatics; catalog No. M-1602 for Plain and Duplex Tracer Controlled Hydromatics.

CINCINNATI

CINCIN

milling machines

HYDRO-MATIC
THE CINCINNATI MILLING MACHINE CO.
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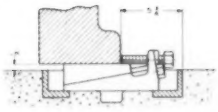
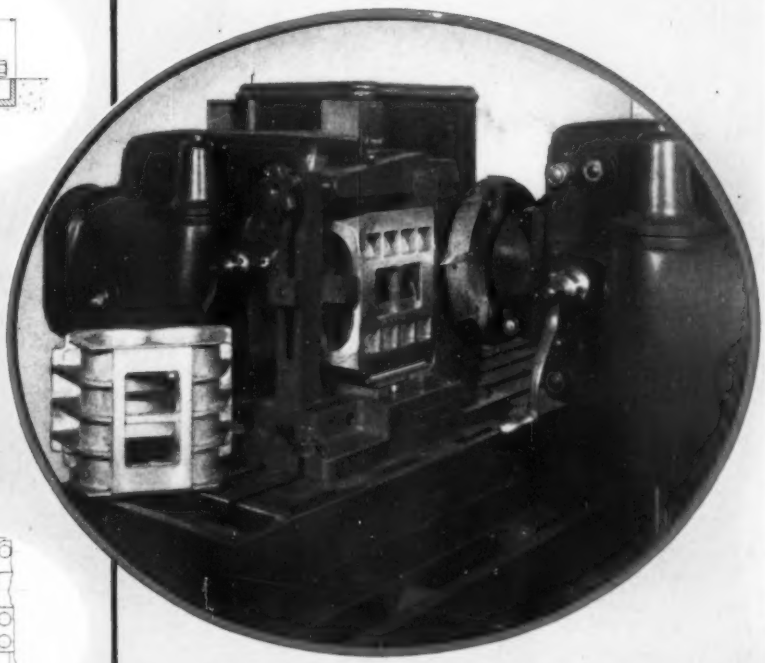
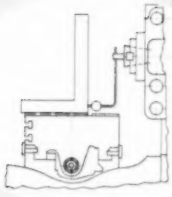


Leveling blocks recommended for older Hydromatics.



This new Duplex Hydromatic, tooled up for a high speed carbide job of milling aluminum crankcases, will run for years if given periodic attention.

Suggested method of checking headstock alignment.



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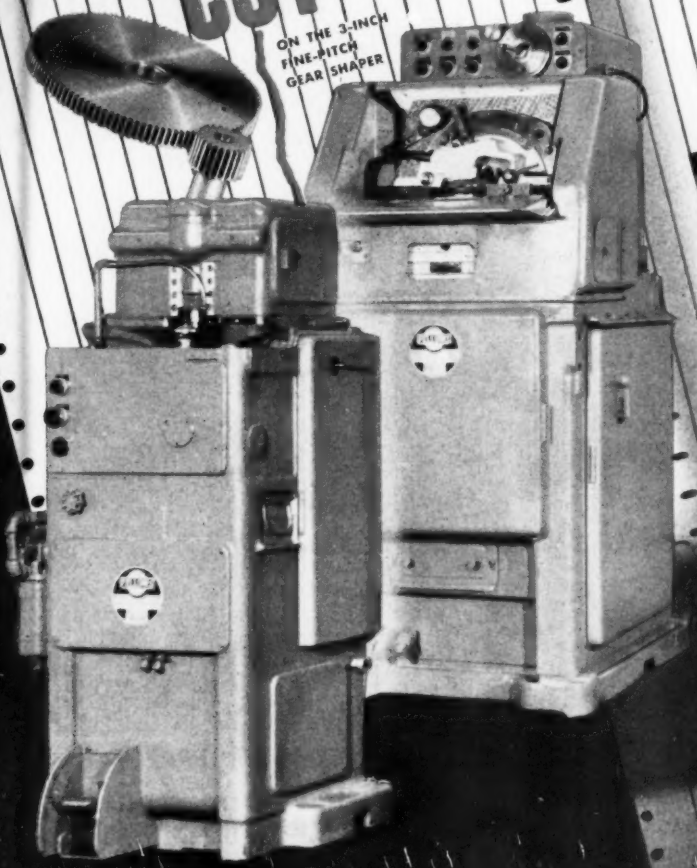
MILLING MACHINES • CUTTER SHARPENING MACHINES
BROACHING MACHINES • FLAME HARDENING MACHINES
OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

ACCURATE

FELLOWS
CUT
ON THE 3-INCH FINE-PITCH GEAR SHAPER

FELLOWS
SHAVED
ON THE NO. 4 FINE-PITCH GEAR SHAVING MACHINE



GEAR SHAPERS
SHAVING MACHINES
THREAD GENERATORS
CUTTERS AND SHAVING TOOLS
GEAR INSPECTION INSTRUMENTS

PLASTICS MOLDING MACHINES

GEAR OPERATIONS

...in Balance

Ability to Mass-Produce Fine-Pitch Gears to Tolerances in Low "Tenths" Spotlights The Fellows Method.

The balanced combination of the Fellows "Fine-Pitch" Gear Shaper and the No. 4 Gear Shaving Machine, aided by the superlative accuracy of Fellows cutters and shaving tools, assures unbelievably close limits. The inspection charts opposite are reproduced from production-run performance—where specifications demanded holding these 48-pitch gears to 0.0003" after shaving. ▾▾▾ The routine super-precision is accomplished by setting up for 3 cuts on the Gear Shaper, and 6 passes on the companion Fellows Shaving Machine. Notice, please, that with accurately-machined blanks it was possible to hold a maximum error after cutting to 0.0005"—and not over 0.0002" after shaving. ▾▾▾ If you have fine-pitch gears to produce, Fellows can help you hold to any tolerances that contemplated service demands. Write, wire or phone the nearest Fellows office.

Fellows

THE FELLOWS GEAR SHAPER COMPANY • Head Office and Export Department • 78 River Street, Springfield, Vermont
Branch Offices: 616 Fisher Bldg., Detroit 2 • 5835 West North Avenue, Chicago 39 • 2206 Empire State Bldg., New York 1

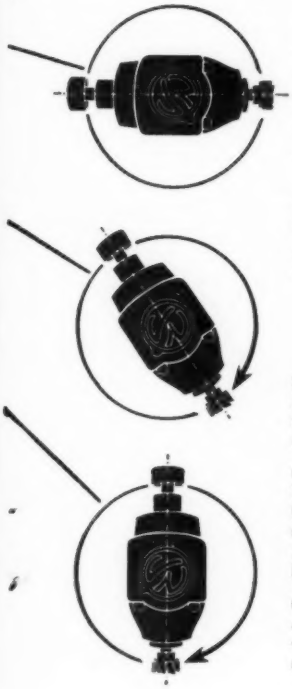
VERSATILITY

One of the that Produces at Lower

No.

VAN NORMAN

Van Norman Features More Profitable Milling Costs with the 22L Ram Type Miller



The versatility of the Van Norman No. 22L miller enables it to meet the daily fluctuating milling requirements in all types of plant work. It minimizes idle machine time, reduces work re-setups, provides more profitable milling at lower costs.

Here's how — the adjustable cutterhead permits horizontal, angular and vertical milling on one miller. Because setups are minimized, errors that often occur when workpiece is changed are eliminated. Overall milling machine capacity . . . vertical to horizontal . . . is always at peak efficiency.

In addition, front and rear directional controls provide ease of operation . . . reduce operator fatigue . . . increase efficiency. Conveniently located speed and feed selectors permit quick selection of proper speed and feed. Rugged construction throughout assures long operating life. Investigate the Van Norman No. 22L Ram Type Miller for your plant. Write for bulletin.

Important Van Norman Features

• VERSATILITY
Rugged adjustable cutterhead permits horizontal, vertical or angular milling . . . all on ONE machine . . . with standard tooling.

• EASE OF OPERATION
Finger-tip front and rear control of all power feeds. . . . Front and rear 6-way rapid traverse. . . . Large easy-to-read graduated dials. Aluminum alloy arbor supports for easy handling.

• SIMPLICITY OF CONTROL
All power feed controls are DIRECTIONAL — operate in direction of desired table, saddle and knee movement. . . . Rotary-type feed selector. . . . Convenient and accessible speed selector.

• INCREASED RANGE
Ram adjustment, in and out over column, provides added work range and capacity.

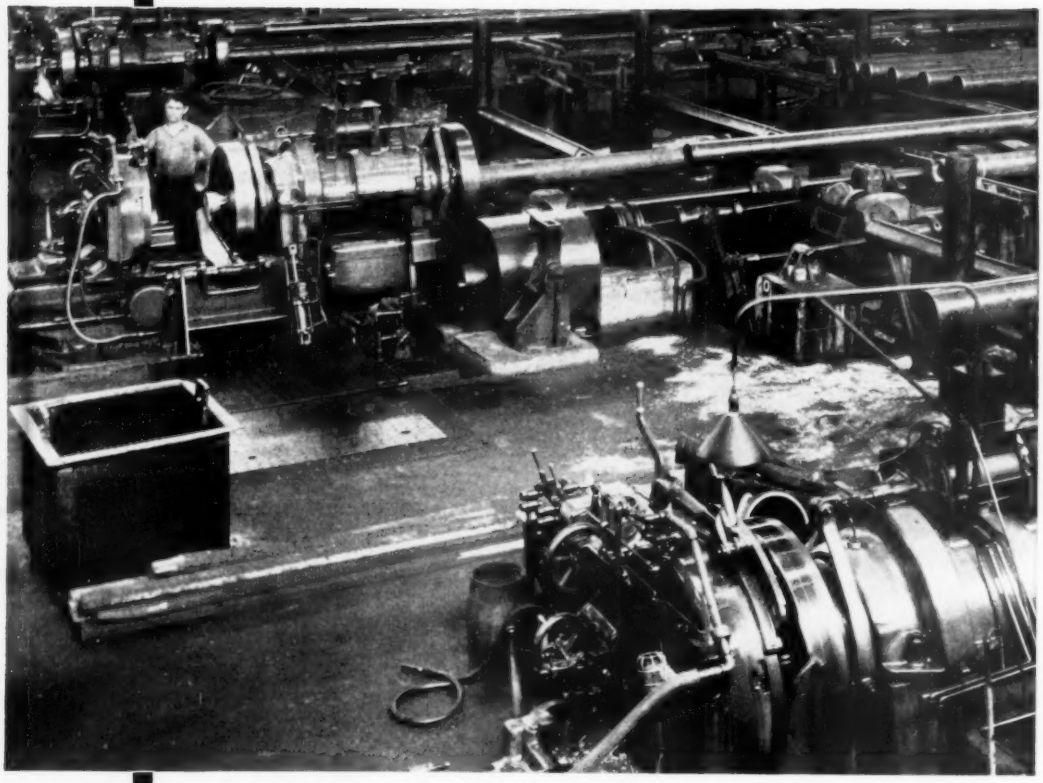
• RIGIDITY AND POWER
Spindle transmission gears are made of hardened alloy steel. . . . Lapped to assure smooth precision operation. . . . Multi-spline shafts operate on taper roller bearings. . . . Rugged column and base. . . . Massive knee.

• LONG LIFE
Precision built. . . . Automatic lubrication.

COMPANY, SPRINGFIELD 7, MASS.

SAVE 5 WAYS ON

- ✓ Fewer Machines
- ✓ Lower Tool Cost
- ✓ Lower Tool Inventory
- ✓ Less Set-up Time
- ✓ Higher Production



PIPE THREADS...

In tightening markets, Landis Pipe Threading Machines offer wide-open opportunities to cut production costs of pipe threads.

Three sizes of Pipe Machines will handle all diameters of pipe from ¼" to 18". Each die head is constructed to handle a wide range of pipe sizes—for example the 6" machine will thread all diameters from 1" to 6". Universal size adjustment allows quick set-up. Thus, a few machines will handle the complete range.

Die heads employ Landis Tangential Pipe Chasers. Interchangeability of the chasers further increases the versatility of these machines. The same chasers may be used for all diameters of threads within the range of a given die head providing that the pitch, form, and taper remain the same, thus reducing tool inventory. Chasers need be replaced only one at a time as needed. Chasers last longer since 80% of their length may be reground as the cutting edge dulls. Line contact with the work reduces friction and chaser wear, allows use of higher cutting speeds, and reduces chaser breakage.

A separate type of machine, the Receding Chaser Pipe Machine, is especially designed to handle A.P.I. Tapered Pipe Threads. Chasers recede into the head at a rate equal to the taper of the thread, ensuring accurate and uniform taper along the full thread length. This mechanism allows the use of smaller chasers, lowering tool cost and dollar tool inventories. Leave-off marks are eliminated by this receding action.

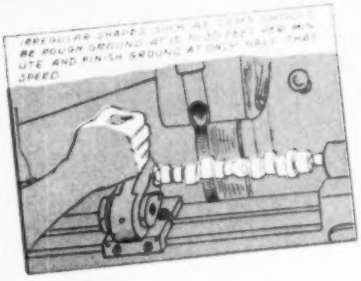
Investigate how Landis Pipe Machines can reduce direct tool cost, increase daily production, and reduce investment in tool inventory and heavy machinery. Write for specifications and further information.

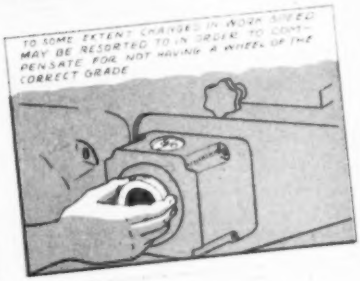
LANDIS Machine COMPANY

WAYNESBORO • PENNSYLVANIA • U. S. A.

FREE DATA

BETTER GRINDING





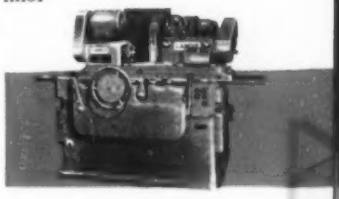
LANDIS

precision grinders

for your Grinding Operators

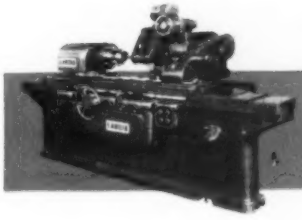
Send for the new edition of the Landis book "BETTER GRINDING"

Thousands of copies have been distributed since "BETTER GRINDING" first appeared. The book has been brought up-to-date—filled with practical, fundamental and helpful information that applies to the operation not only of LANDIS grinders but all precision cylindrical grinders.



- Valuable help in training young mechanics—

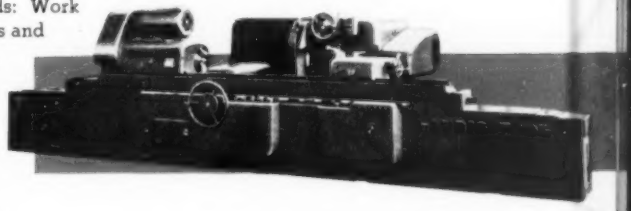
  Leads them step by step through grinding operations.
  Tells how to avoid trouble setting up work.
  Gives many tips on proper operation and maintenance of grinders.



- Refresher course for veteran operators—

  Helps them get more out of their machines.
  Simplifies trouble shooting.
  Makes their job easier, production higher.

Take advantage of this service that LANDIS TOOL COMPANY provides free. Discover how the NEW "BETTER GRINDING" can help you.



17 Chapters devoted to better grinding methods: Work Centers and Centers in the Work . . . Work Drivers and Driving Dogs . . . Work Rests . . . The Diamond . . . Wheel Dressing and Wheel Truing . . . Mounting and Balancing the Wheel . . . Grinding Wheel Coolant . . . Multiple V-belt Drives . . . Wheel Spindles and Bearings . . . Grinding Wheel Feed . . . Grinding Wheel Width . . . Speed of Work Carriage Traverse . . . Work Speed . . . Grinding Wheel Speed . . . The Grinding Wheel . . . Chatter . . . Miscellaneous Tips. The book is easy to read and understand; enlivened by 90 two color sketches; has sturdy, long lasting cover; is Wire-O bound—lies flat when open; and is a convenient 6¼" x 9¼" size.

129

ALL YOU NEED TO DO IS *send this coupon*

Send me a FREE COPY of "BETTER GRINDING"
Please print or type name and address.

NAME: _____

COMPANY: _____

STREET: _____

CITY: _____ ZONE: _____ STATE: _____

Address to: TECHNICAL LITERATURE DEPARTMENT
LANDIS TOOL COMPANY
WAYNESBORO, PENNSYLVANIA

HOW WOULD YOU MACHINE A 140 TON CASTING

HERE'S HOW

G. & L. MACHINES READILY PRODUCE HEAVY DUTY FORGING MACHINE PARTS

A 280,000 lb. piece of metal is a brute to handle! Yet when this heavy forging machine component is placed on a floor type Giddings & Lewis Horizontal Boring, Drilling and Milling Machine it becomes a *routine shop job.* The reason—G. & L.'s offer a simple means of work mounting which eliminates staggering setup problems common to other types of equipment. Certainly the part could be twice this size and still be machined easily and accurately. And—

G. & L. MACHINES EFFECTIVELY PRODUCE OTHER FORGING MACHINE PARTS . . .

Like this tough alloy steel forging hammer ram having a 5' 6" long taper bore. Overall time to bore this ram on the G. & L. is 18 hours as compared to 36 hours when handled differently.

If metal must be removed fast, such as the cavitation in the forging die bolster, the G. & L. machine responds 55% faster than the time formerly required for the same operations. Thus—

It is common sense to investigate the multiple machining advantages inherent in G. & L. machines when you are confronted with unusual production problems. There is a way to do your work and G. & L. engineers will show you how.

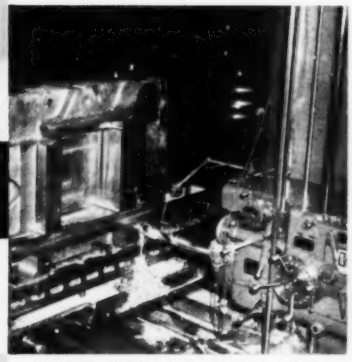


Photo Courtesy Ajax Manufacturing Co., Cleveland, Ohio

Boring, drilling and milling operations are performed on this bolster for a 3000-ton upsetter 55% faster and more efficiently on the 350-T G. & L. horizontal boring machine.

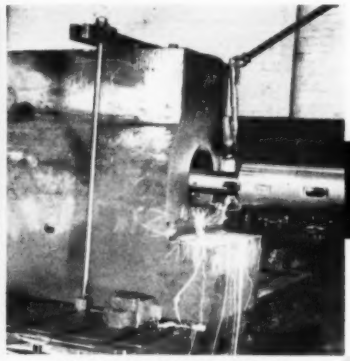


Photo Courtesy Erie Foundry Co., Erie, Pa.

Hammer rams like this are completely machined 50% faster on G. & L. equipment.

G&L

HYPRO

DAVIS

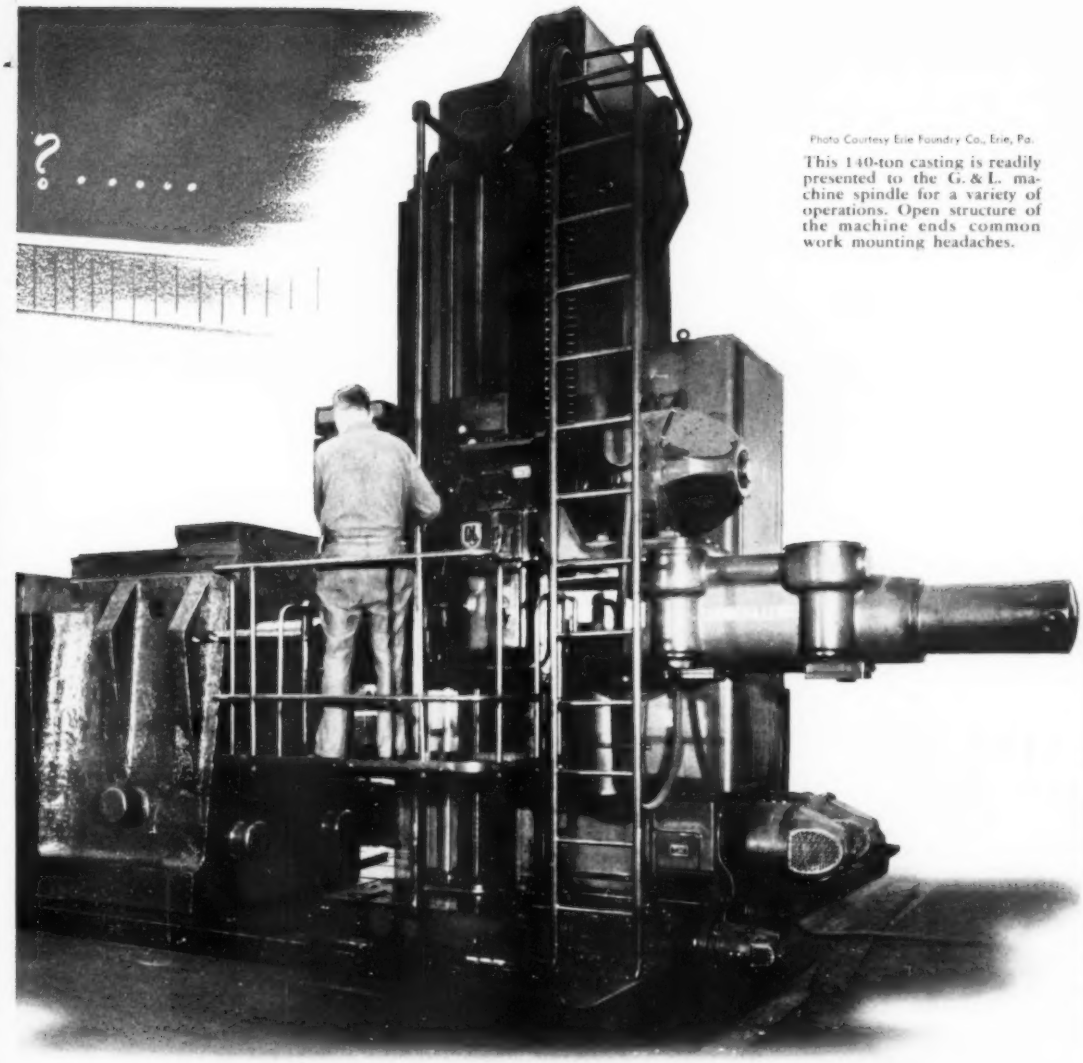


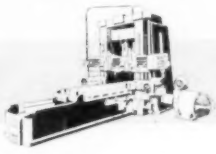
Photo Courtesy Erie Foundry Co., Erie, Pa.

This 140-ton casting is readily presented to the G. & L. machine spindle for a variety of operations. Open structure of the machine ends common work mounting headaches.

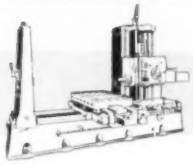
GIDDINGS & LEWIS MACHINE TOOL COMPANY

FOND DU LAC, WISCONSIN, U.S.A.

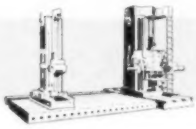
G. & L. HYPRO Double Housing Planer



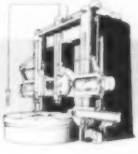
G. & L. Table Type Horizontal Boring Machine



G. & L. Floor Type Horizontal Boring Machine



G. & L. HYPRO Vertical Boring and Turning Mill



Cutaway shows simple, rugged construction of Link-Belt Fluid Drive.

LINK-BELT Electrofluid Drive

with constant

LINK-BELT

FLUID DRIVES

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices, Factory Branch Stores and Distributors in principal cities.

12.598

AS EFFICIENT — as modern as the automatic transmission in today's automobile. Link-Belt Electrofluid Drive constantly provides a smooth flow of cushioned, shock-free power transmission. Ideal for loads of high inertia, repetitive shock or high starting torque type.

Here's how constant "CUSHION ACTION" reduces wear — cuts maintenance — and often lowers initial investment.

- Both motor and driven machine last longer because constant CUSHION ACTION protects them from overload and shock — torque, even under stall conditions, is limited by fluid drive capacity.
- On high-inertia loads requiring high starting torque, CUSHION ACTION permits motor to attain speed producing maximum torque before fluid drive output shaft revolves — often eliminating need for special or oversize motors.
- Because motor reaches 70% of full-load speed before engaging load, CUSHION ACTION starting current is less than half of normal, and power factor stays high.
- Maintenance of trouble-free Electrofluid Drives is limited to an occasional inspection of oil level.

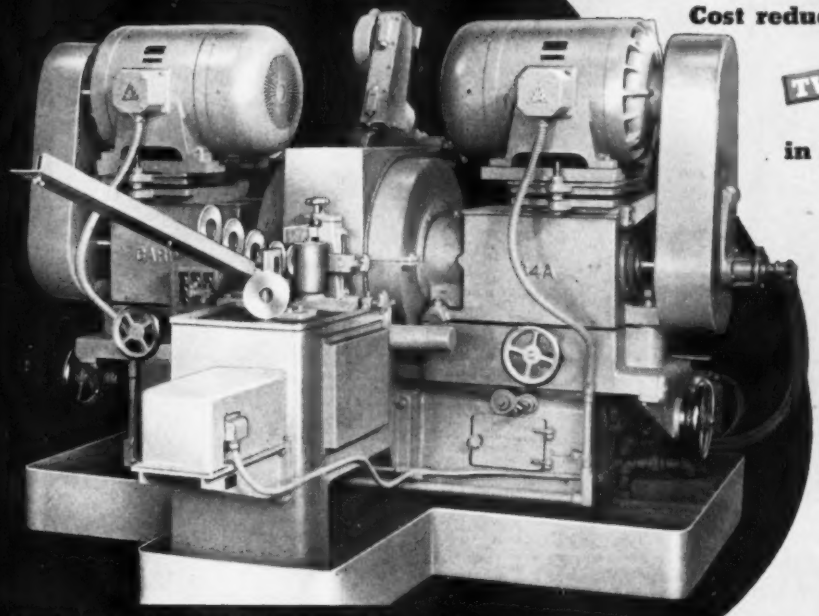
What's more, you get all the exclusive advantages of constant CUSHION ACTION while maintaining the high efficiency of your existing drive. Book 2485 has complete information on five types of Link-Belt Fluid Drives — Electrofluid Drive, Electrofluid Gearmotor, Fluid Drive, Fluid Gear Drive and Fluid Coupling Drive.

GARDNER

precision disc Grinders

Grinds Parallel Faces of 15 Discs Per Minute

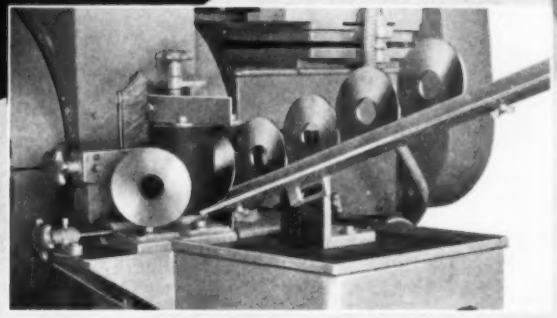
Cost reduced by grinding TWO surfaces in ONE operation



Grinding hardened clutch wear plates, 15 pieces per minute. .010" stock removal per cut 5.125" O. D., .188" thick. Limits .002"—.003" flatness, parallelism and uniformity. Gardner Double Disc Precision Grinder 84B-30".

107 M

Request Bulletin No. 12-7.



Gravity feed to power operated adjustable roll feed-thru fixture.

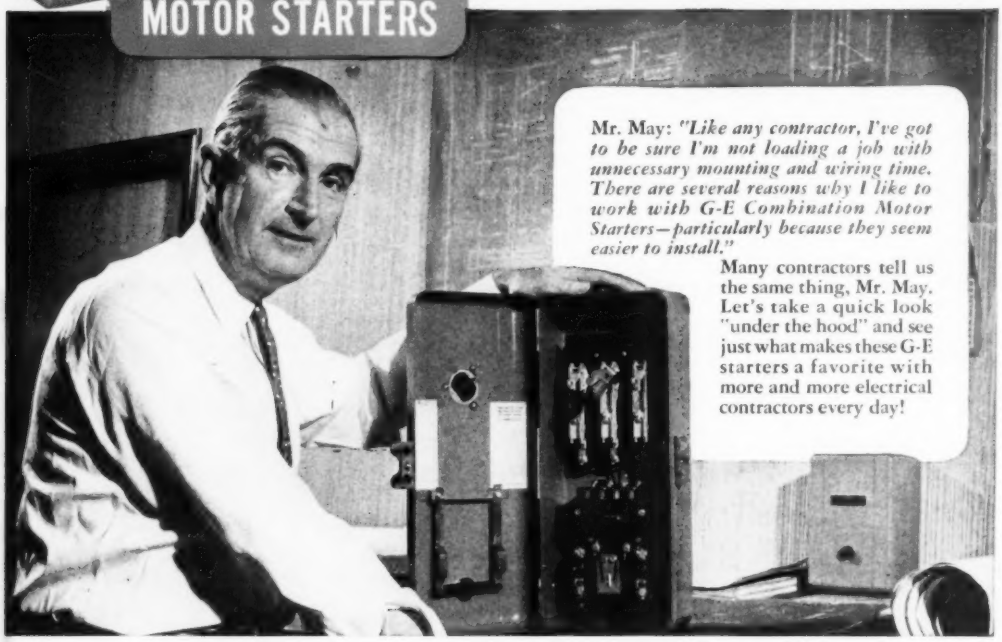
GARDNER MACHINE COMPANY

410 East Gardner Street • Beloit, Wisconsin, U.S.A.

COMBINATION
MOTOR STARTERS

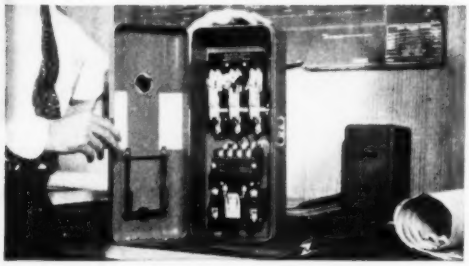
...save wiring

E. G. MAY, ELECTRICAL CONTRACTOR,

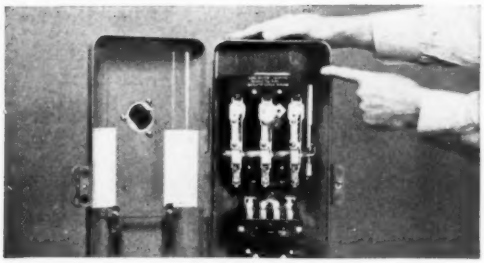


Mr. May: *"Like any contractor, I've got to be sure I'm not loading a job with unnecessary mounting and wiring time. There are several reasons why I like to work with G-E Combination Motor Starters—particularly because they seem easier to install."*

Many contractors tell us the same thing, Mr. May. Let's take a quick look "under the hood" and see just what makes these G-E starters a favorite with more and more electrical contractors every day!



1 Mr. May: *"Suppose we start with the mounting. There's a real time-saver!"*
That's right, Mr. May. Both starter and disconnect switch are mounted in one case. Thus, they're installed as a unit! You save wiring time and your customer gets a neater installation!



2 Mr. May: *"Wiring room is mighty important to a contractor."*
Then you should like the layout of this starter. There's plenty of room at top and bottom for line and load wiring. Of course, we take care of wiring the disconnect switch to the starter at the factory.

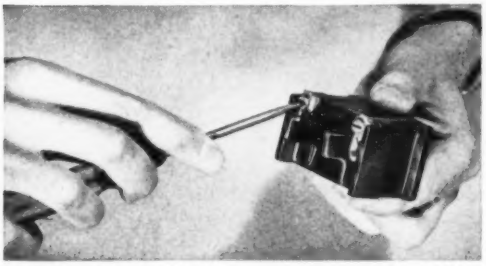
GENERAL ELECTRIC

730-24

time for these 4 reasons

REVEALS THE "REASONS WHY" HE PREFERS G-E COMBINATION STARTERS

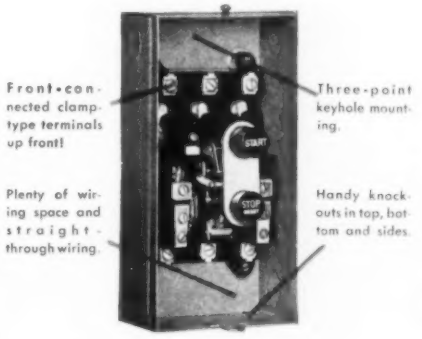
3 Mr. May: *"Having these terminals up front makes them easy to work with!"*
Remember, too, you're working with large pan-head screws. All you do is strip the wires, slide them under the terminal clamps which ride out with the screws, and then tighten. All terminals are big, rugged and permanently anchored.



4 Mr. May: *"I've heard a lot about this coil. What's so different about it?"*
It's completely encased in plastic—so that neither you when installing the starter, nor your customer when servicing it can damage the coil with a slipping screwdriver; and you can assure your customers that these "Strong Box" coils last longer because water, dust and oil are *sealed out!*

G-E Manual Starters ...easier to install, too!

For manual starting of 7½ hp or smaller motors, you can't beat a G-E starter for easy installation, long life. Built to the same rugged specifications as the magnetic starter, it includes many of the same features for quick-wiring:


Front-connected clamp-type terminals up front!
Three-point keyhole mounting.
Plenty of wiring space and straight-through wiring.
Handy knock-outs in top, bottom and sides.
START
STOP

These starters are available with either push-button or toggle-switch operation, and can also be obtained in water-proof, dust-proof, or explosion-proof enclosures . . . 2-, 3-, or 4-pole forms.

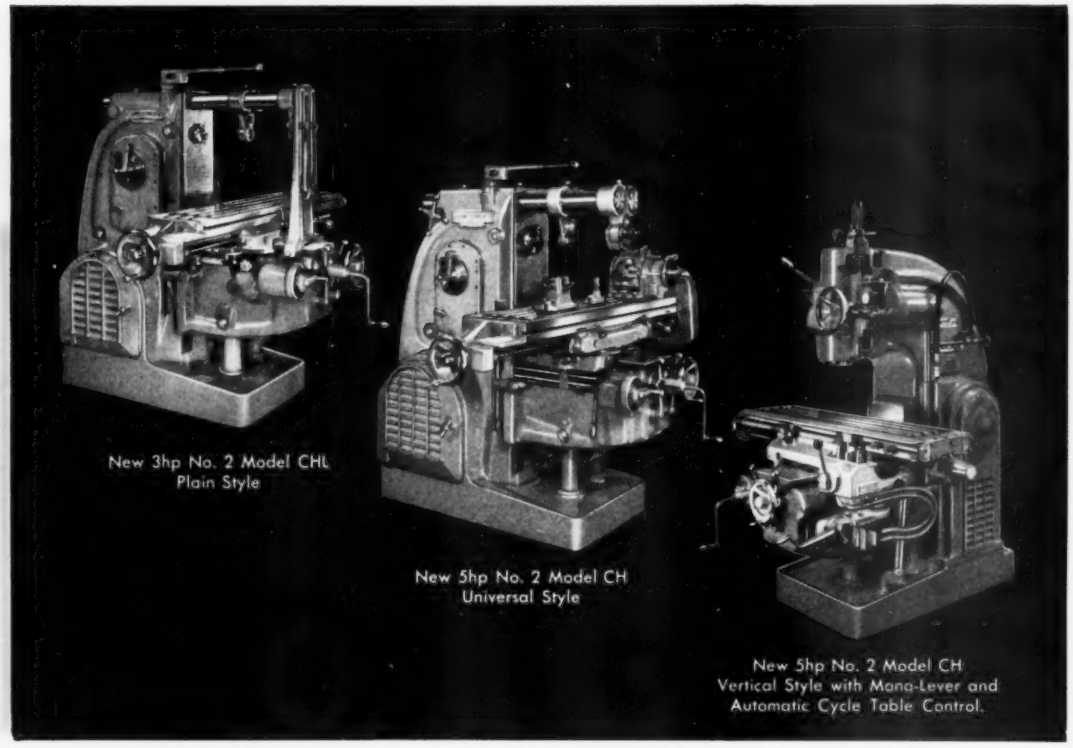
G.E. also offers a complete line of control accessories to make operations more automatic . . . more convenient.

BUY ONE AND COMPARE!

Take any G-E motor starter apart and inspect it. See for yourself why G-E starters last longer, cost less to install, and are easier to maintain than any starters you can buy. Your G-E representative or authorized distributor can supply many models of G-E starters in NEMA sizes 0, 1, 2, and 3 for motors up to 50 hp; anticipate your requirements and place your order early. For more information on magnetic starters, write for Bulletin GEA-5153; manual starters, Bulletin GEA-1522. Section 730-24, *General Electric Company, Schenectady 5, N. Y.*

Kearney & Trecker Announces . . .

THREE NEW KNEE


New 3hp No. 2 Model CHL
Plain Style
New 5hp No. 2 Model CH
Universal Style
New 5hp No. 2 Model CH
Vertical Style with Mono-Lever and
Automatic Cycle Table Control.

The specifications below point up the new larger working ranges of these new Kearney & Trecker machines. You'll find these larger working ranges provide you with new major cost-cutting possibilities for both tool-room and production work — long or short runs. Feeds and speeds listed are standard ranges. Optional ranges are available at extra cost.

Machine	TABLE Working Surface	TABLE Power Feed Travel Plain & Universal	TABLE Power Feed Travel Vertical	Feeds Number & Range	Power Rapid Traverse — " Per Min.	SPINDLE Nat'l Std. Taper	SPINDLE Speeds — Number and Range
No. 1 Model CH Plain, Universal and (swivel head) Vertical	40" x 10½"	Long. 22" Cross 8" Vert. 17"	22" 10" 16"	16—½" to 32" 16—¼" to 16"	150" 75"	40	16 — 25 to 1500 RPM
No. 2 Model CHL Plain, Universal and (swivel head) Vertical	46" x 10½"	Long. 28" Cross 10" Vert. 17"	28" 10" 16"	16—½" to 32" 16—¼" to 16"	150" 75"	40	16 — 25 to 1500 RPM
No. 2 Model CH Plain, Universal and (sliding head) Vertical	50" x 12"	Long. 28" Cross 10" Vert. 18"	28" 12" 15"*	16—¼" to 32" 16—⅛" to 16"	150"—plain & vert. 100"—universal 75"—plain & vert. 50"—universal	50	16 — 25 to 1500 RPM

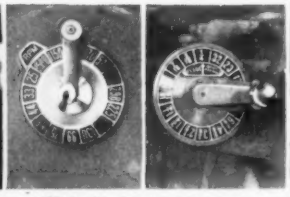
*Add 4" vertical travel for sliding head

TYPE MACHINES

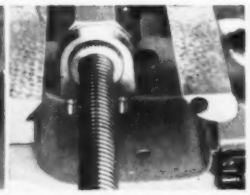
3 and 5 Horsepower

New Kearney & Trecker No. 1 CH, No. 2 CHL and No. 2 CH Milling Machines (Plain Universal and Vertical Styles) have every performance-proven operating and construction feature needed for modern short-run or production milling requirements

Positive locking, rapid-set dials are vapor blasted, for high visibility — avoid costly setting errors.



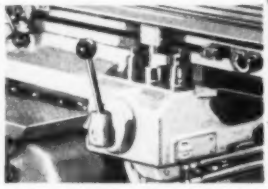
Wider feed and speed ranges meet modern cutting tool requirements — optional ranges available.



Extra large dia. table feed screw and extra long bronze nut with backlash eliminator gives better climb milling performance.

Positive metered pressure lubrication to saddle, table and knee ways and table feed assembly assure greater machine life.

3-bearing spindle design provides solid support for greater rigidity and cutting efficiency using modern cutting tools.



Mono-Lever and Automatic Cycle Table Control (optional) provides high speed production on long or short runs — cuts operator fatigue.

New, heavier columns are scientifically designed to absorb vibration from heavy cutting loads...give greater overall rigidity.

If you're looking forward to modernizing your tool-room or milling machine line — you can't afford to overlook these new 3 and 5hp knee types. They offer you wider working ranges, more practical operating features and heavier construction than any comparable equipment. They've been designed to fully answer today's milling needs — and tomorrow's as well. For complete data on these machines, contact your Kearney & Trecker representative or write direct. Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wis.

KEARNEY & TRECKER
MILWAUKEE
MACHINE TOOLS

Warner & Swasey 5-Spindle Automatic Chucking Machine, one of Warner & Swasey's line of automatic machines.

YOU CAN MACHINE IT BETTER, FASTER, FOR LESS WITH WARNER

Don't buy five machines when two will do the job-BETTER!

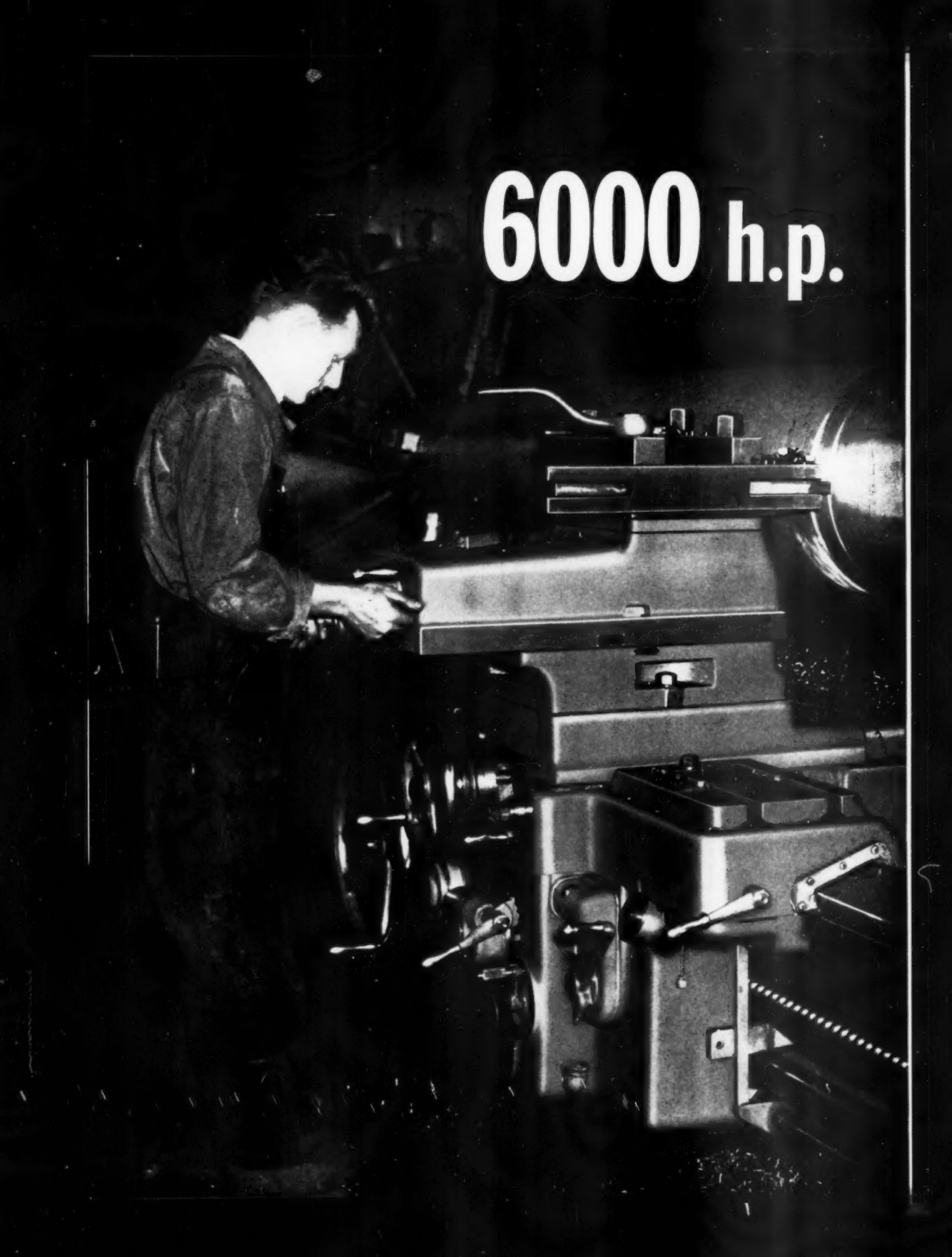
● Let's say you received a defense order in 1941 that required purchasing 5 turret lathes.

Today, when you receive a similar order, it might be quite natural for you to assume you'd again need 5 machines. But just as weapons or products have developed, so have the tools with which they're made.

In many cases these products can be made faster and more profitably with Warner & Swasey automatics—machines developed since the last war. Instead of reordering, say, 5 turret lathes, you may need only 2 of these automatics. They'll cost you less in total investment, require less floor space and fewer operators, and turn out more uniform parts at a higher rate.

Of course, there are—and always will be—many jobs that should be done *only* on turret lathes. But before you simply reorder according to your past requirements, first call in your nearest Warner & Swasey Field Representative. He may be able to show you how you can boost your production and profits with Warner & Swasey automatics.

& SWASEY TURRET LATHES, AUTOMATICS AND TAPPING MACHINES


6000 h.p.

will go through this shaft!

This tailshaft turns the screw in a C-2 Cargo Vessel. It's made to take the relentless pounding of a 6000 h.p. power plant for weeks without letup.

To machine it accurately and economically, Moore Dry Dock Co. of Oakland, California needed a powerful precision lathe. That's why they gave the job to a new LeBlond 50″ Heavy Duty Lathe . . . recommended by LeBlond Distributor, Bulotti Machinery Co. of San Francisco. Result? *17 hours off former machining time with a cost saving of 18%.*

This LeBlond Lathe provides fifty horsepower; spindle speeds up to 247 r.p.m.; rigid construction. It makes possible latest turning techniques with carbide tools; gives better finish, closer tolerances and greater economy.

Operators' work is easier, too, because of convenient features—single-lever feed control, exclusive *power rapid traverse* and many more.

Whether you turn ten-ton shafts or ten-ounce bushings, there's a LeBlond Lathe to turn them faster, better. Your nearby LeBlond Distributor will tell you about the 50″ Heavy Duty and other late model lathes. Call him or write—

THE R. K. LEBLOND MACHINE TOOL CO., CINCINNATI 8, OHIO

Ask for Bulletin HD-180 A
for more information on the 50″ Heavy Duty.

turned faster by LeBLOND *of Cincinnati*

WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES • *FOR MORE THAN 63 YEARS*

Top

Toolmakers Use MORSE TAPS

... because they tolerate "No Compromise with Precision"

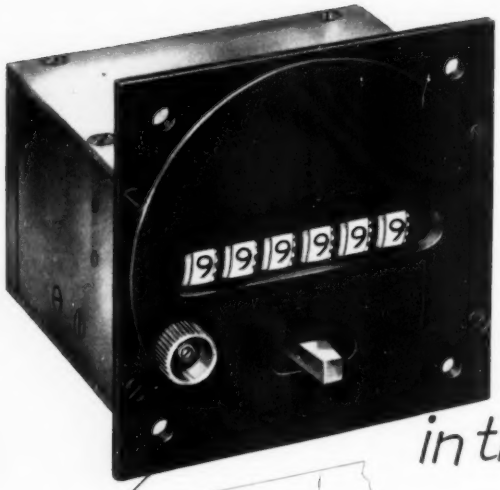
Look at a Morse Micrometer Tap, as this toolmaker is doing . . . and you're looking at *a finely wrought piece of industrial jewelry.*

And that goes for *all* Morse Taps of every type . . . high-speed or carbon . . . cut-thread or ground . . . regular or special . . . plain or Electrolized. For Morse makes them *all: Spiral-pointed taps* to drive the chips ahead in through-holes . . . *Spiral-fluted taps* to draw the chips out of bottomed holes . . . *Straight-fluted taps* for jobs where the set-up indicates *they'll* work best.

So for any tapping job . . . in ferrous or non-ferrous metals, plastics or die-cast . . . remember that if you want Morse-Quality workmanship (cleaner, stronger threads that cut far faster, with longer tap life) then you'll find you *have* to buy genuine Morse Taps. See your Morse-Franchised Distributor now, for the top taps for *your* job.

Morse Twist Drill & Machine Company
NEW BEDFORD, MASS.
(Div. of VAN NORMAN CO.)
Warehouses in New York, Chicago, Detroit, Houston, San Francisco

MORSE
Cutting Tools



...and here's a Counter that talks to Jet-Testers in their own language...

Added Evidence that—

Everyone Can Count on VEEDER-ROOT

This technician is reading an electrically operated counter, used to record data in test instruments that check aircraft performance.

And this counter is one of innumerable Veeder-Root specials now on duty in every arm of the service. If you can use such counters (or need counters of special design) on D-O—rated orders, then you can count on Veeder-Root to help you with all possible dispatch.

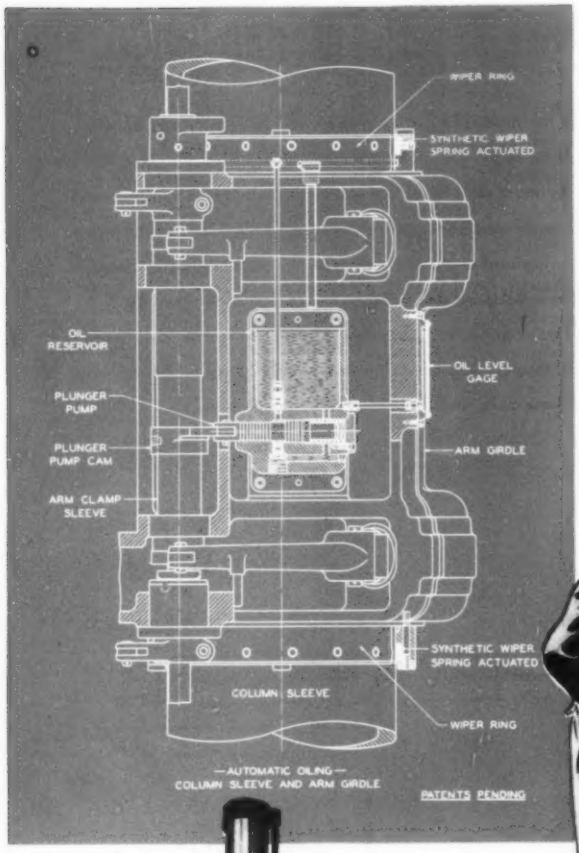
VEEDER-ROOT INCORPORATED
"The Name That Counts"
HARTFORD 2, CONN. • GREENVILLE, S.C.
Montreal 2, Canada • Dundee, Scotland
Offices and agents in principal cities

VEEDER-ROOT COUNTERS *"Count Everything on Earth"*

Just a memory now

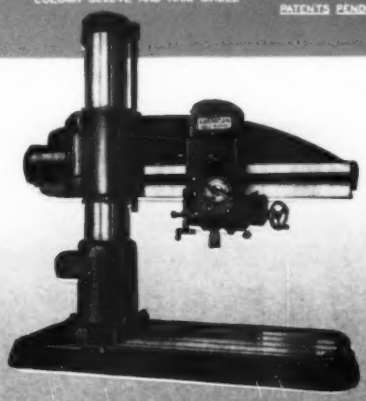
Column Scoring a thing of the past...

We've done something about it—



On the new "AMERICAN" Hole Wizard Radial the arm girdle and its mating column area are automatically oiled and cleansed. Actuation of the elevating lever operates a plunger pump in the arm girdle forcing oil into the distributing reservoir at the top which lubricates the entire arm girdle area. Abrasion and oil resistant synthetic wipers at top and bottom trap the oil to prevent leakage and thoroughly cleanse the column of all dirt and foreign matter ahead of the arm girdle when raised or lowered.

This positively reduces the danger of column scoring to an absolute minimum — just another "Hole Wizard" feature that insures long life and dependable service.

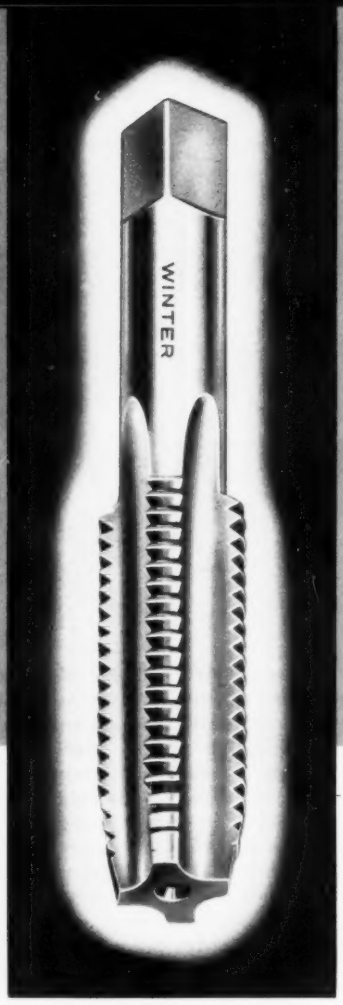


Bulletin No. 327 describes this and other exclusive "Hole Wizard" features of proven value. Want one?

THE AMERICAN TOOL WORKS CO.

Cincinnati, Ohio, U. S. A.

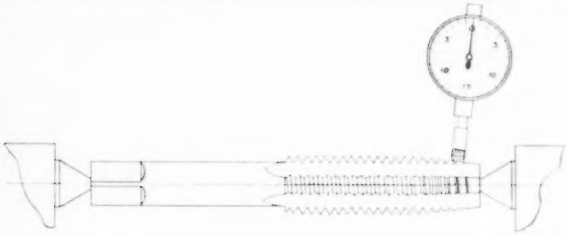
LATHES AND RADIAL DRILLS



QUALITIES OF CRAFTSMANSHIP
IN WINTER HAND TAPS

Accurate and Concentric Chamfers

For the production of uniformly accurate tapped holes all cutting edges must be truly concentric with the axis of the tap. They must also be of the same shape and of equal spacing. Accurate and concentric chamfers, along with exact flute spacing and uniform flute contours, are qualities inherent in Winter *Balanced Action* Taps. The complete Winter line includes hand, nut, chip driver, machine screw, pipe, pulley, and tapper taps, stocked conveniently at Winter branches in New York, Detroit, Chicago, and San Francisco.

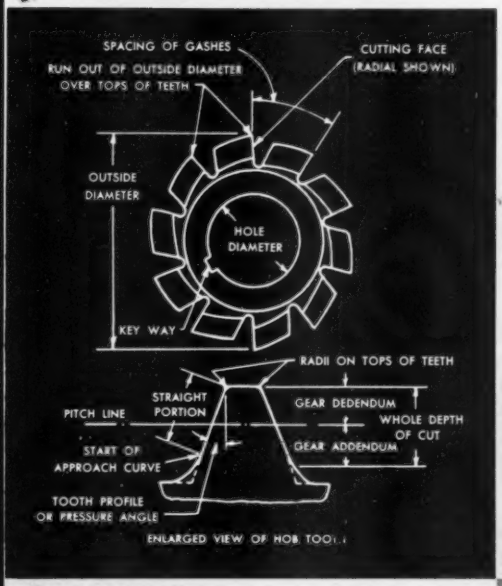


ALWAYS AT YOUR SERVICE

YOUR LOCAL DISTRIBUTOR carries a complete stock of WINTER Taps on his shelves—as close to your tapping problems as the telephone on your desk.

WINTER BROTHERS COMPANY • Division of the National Twist Drill and Tool Company, Rochester, Michigan, U. S. A. • Distributors in Principal Cities • Branches in New York, Detroit, Chicago, San Francisco

POINTS OF SUPERIORITY IN NATIONAL HOBS

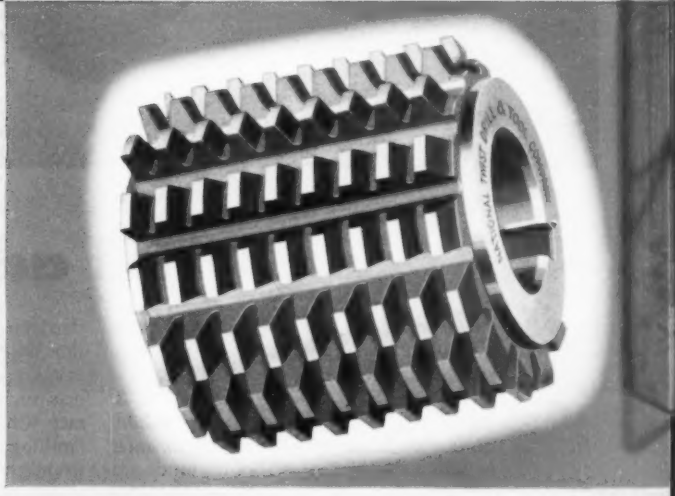


Manufacturing Control

Every step in the production of National Hobs, from hammer forging to final inspection, is subject to close manufacturing control. Blanks must pass both chemical and metallurgical laboratory tests before release to the manufacturing departments. Tooth size and shape must be absolutely uniform; hardening and tempering operations are carefully regulated to effect the best cutting qualities. Inspection, by means of specially designed gauges, maintains accuracies of finished hobs within close tolerances. National manufactures a complete line of cutting tools including twist drills, reamers, milling cutters, hobs, counterbores, and special tools.

CALL YOUR DISTRIBUTOR

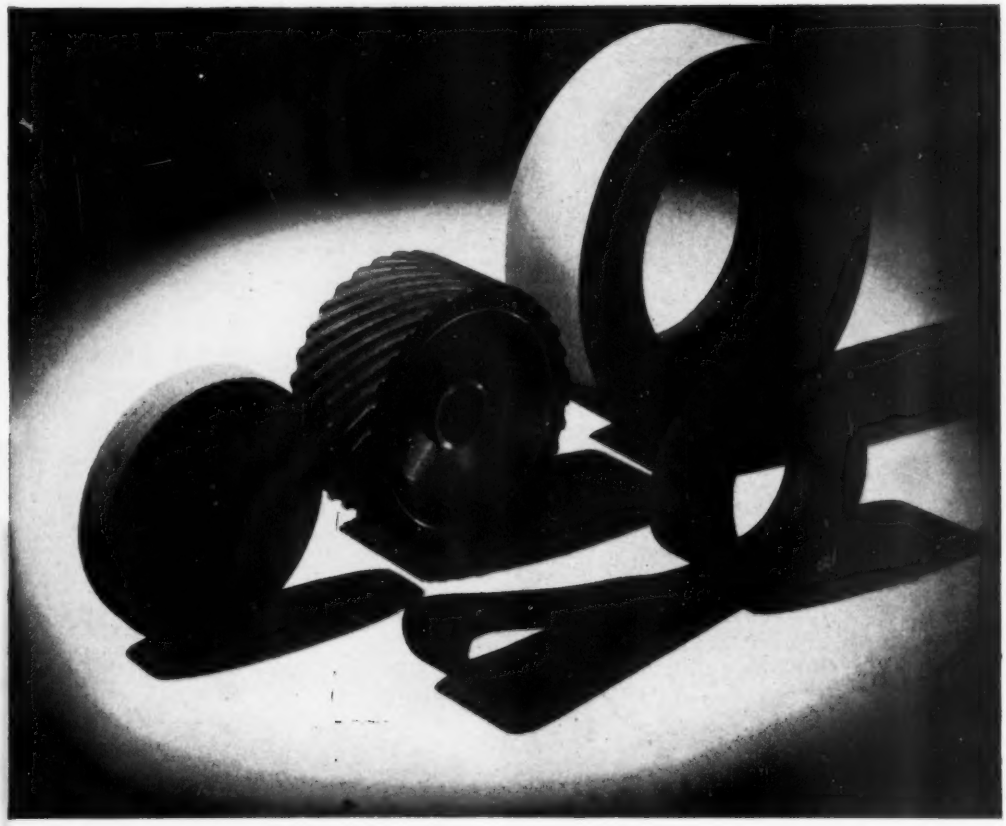
LEADING DISTRIBUTORS EVERYWHERE offer complete stocks of NATIONAL metal cutting tools. Call them for cutting tools or any other staple industrial products.



NATIONAL TWIST DRILL & TOOL ROCHESTER, MICH., U.S.A.

National

NATIONAL TWIST DRILL AND TOOL COMPANY • Rochester, Michigan, U.S.A.
Distributors in Principal Cities • Factory Branches: New York • Chicago • Detroit • Cleveland • San Francisco



Impartial advice...

That's what you get when you call your CARBORUNDUM representative for information on abrasives. He's a specialist who can recommend from a *complete* abrasive line. If you're using a belt where a wheel would do the job better, he will tell you so since he sells a *complete* line of abrasive products.

Furthermore, he is posted on all new methods and improvements throughout the entire field of abrasives—a specially important factor to you if your production requirements change frequently. For instance, he'll bring you improved products such as CARBORUNDUM'S "61" Contact Wheel (illustrated above), with the "milling cutter" design that raises the practicability of belt grinding to new levels.

For real results in all abrasive applications, see your CARBORUNDUM representative. See him soon...and often.

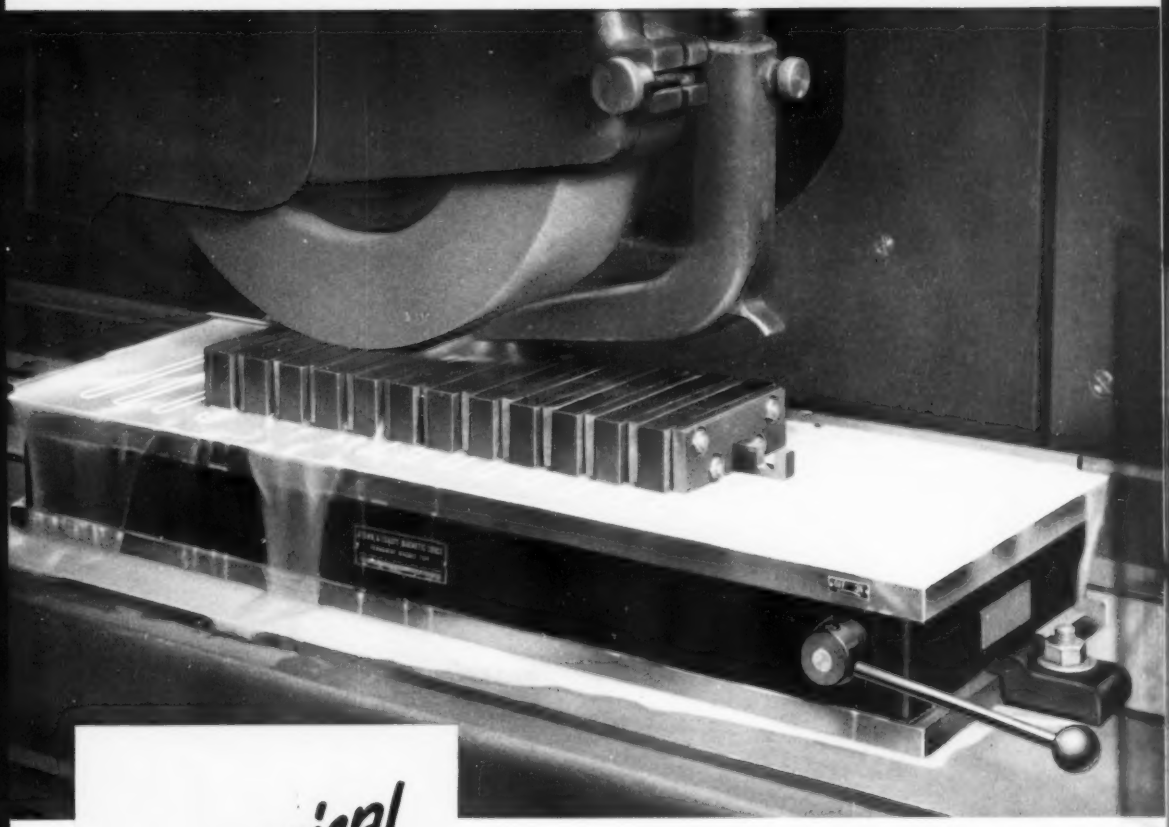
Only **CARBORUNDUM**

TRADE MARK

makes ALL Abrasive Products...to give you the proper ONE

"Carborundum" is a registered trademark which indicates manufacture by The Carborundum Company, Niagara Falls, N.Y.

Productivity
. . . from Brown & Sharpe



Economical way to save machinists' time

PERMANENT MAGNET CHUCKS by Brown & Sharpe make the most of a skilled machinist's time — let him do, speedily, many tasks that require extra work by other means.

These economical time-savers are completely portable, have no wires to connect, cost nothing to operate, hold as long as desired without heating, last indefinitely. Permanent Magnet Chucks speed setting up . . . eliminate the need for clamps, vises, jigs or fixtures on many jobs. A quick shift of a lever engages or disengages magnetic holding power.

Complete line includes Rectangular Models for grinding, inspecting, light machining; and Rotary Models for light lathe work, cylindrical and face grinding. Rectangular Models available in 8 sizes from $2\frac{7}{16}$" x $5\frac{1}{4}$" to $12\frac{1}{8}$" x 36"; Rotary Models in 5", 7", and 9" diameters. For sale only in the United States and its territories. Write for catalog.

Shrewd safeguard against toolroom bottlenecks...

BROWN & SHARPE No. 10N Cutter and Tool Grinding Machine

with UNIVERSAL or PLAIN Equipment

TODAY'S HEAVIER DEMANDS on your production tools make it more important than ever to keep all the machines in your shop producing — and producing at top efficiency.

The Brown & Sharpe No. 10N Cutter and Tool Grinding Machine is designed especially to help prevent those toolroom bottlenecks that rob your shop of scheduled production. Simplicity, flexibility, and convenient controls permit sharpening of cutters and tools in minimum time — with keen, accurate edges for efficient cutting.

The No. 10N is available with Universal equipment, for complete cutter and tool sharpening, plus light cylindrical, internal and surface grinding jobs — or with Plain equipment, where the requirements are for cutter and tool sharpening only. The same basic design is common to both. Write for complete illustrated bulletin.

No. 10N CUTTER AND TOOL GRINDING MACHINE WITH UNIVERSAL EQUIPMENT
Centers swing 10" dia.; takes 20" length; 3 wheel speeds 3000 to 4500 R.P.M.

Time-Saving, Money-Saving

GROUND FLAT STOCK

OIL HARDENING — WATER HARDENING

The economies of using steel stock accurately pre-ground to size are now available to you on an even broader scale. Brown & Sharpe offers a choice of oil or water hardening types in 16 different thicknesses from 1/64" to 1" . . . a total of 145 sizes. What's more, in eight thicknesses up to and including 3/16", a single type of stock now serves for either oil or water hardening . . . a convenience available only in the Brown & Sharpe line.

Further conveniences of Brown & Sharpe Ground Flat Stock include continuous repeat markings on every piece, for instant identification; and a protective envelope in distinctive color. Write for folder.

Quality Control Equipment that Speeds Precision Work

JOHANSSON GAGE BLOCKS

With Brown & Sharpe Jo-Blocks on the job, mass-produced parts can be held to specified tolerances with minimum time-loss for checking or re-setting gages . . . every department is equipped with accurate, easy-to-use standards that enable prompt detection of any wear or incorrect setting in gages that might cause high rejection rate.

In addition, Jo-Blocks serve as reliable master laboratory standards for speedy, accurate setting of work standards and as positive guides for accurate layout and set-up work. Made in 3 guaranteed accuracy standards: .000002", .000004", and .000008" per inch . . . sold as single blocks or in sets. Write for catalog.

WE URGE BUYING THROUGH THE DISTRIBUTOR

Brown & Sharpe

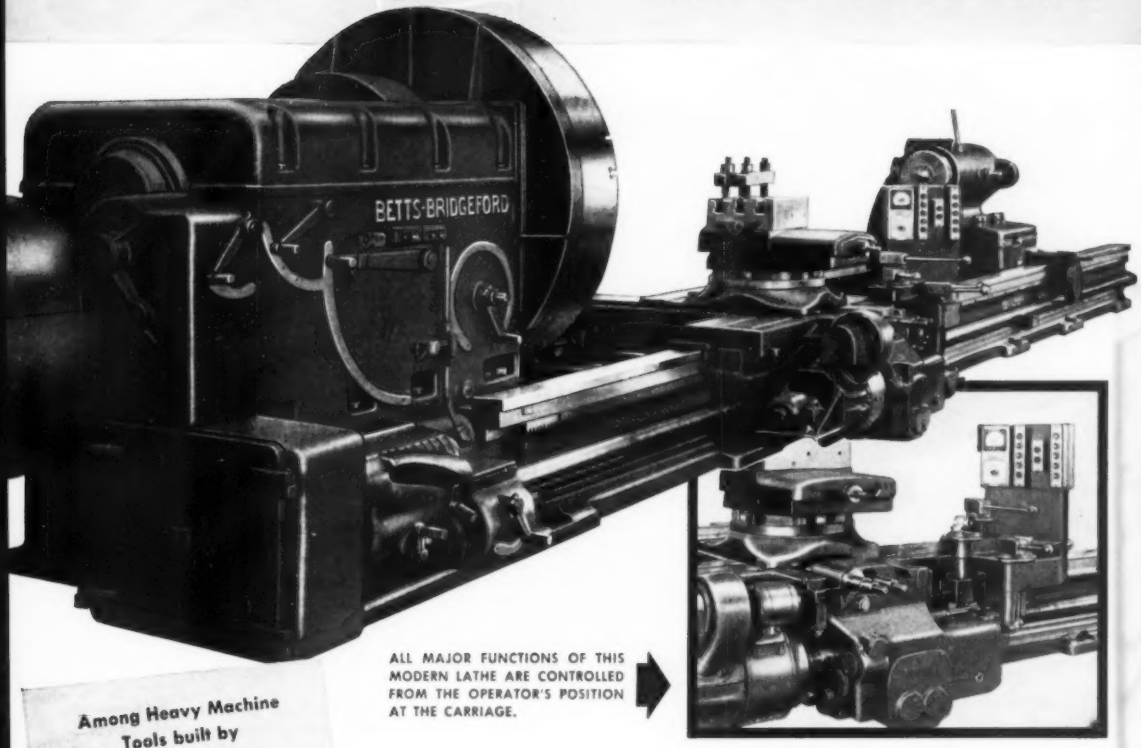
Milling Machines • Grinding Machines • Screw Machines • Cutters • Machine Tool Accessories
Machinists' Tools • Electronic Measuring Equipment • Johansson Gage Blocks • Permanent Magnet Chucks

BROWN & SHARPE MFG. CO., PROVIDENCE 1, R. I., U.S.A.

BETTS-BRIDGEFORD

ELECTRONIC FEED

60" HEAVY DUTY LATHE



ALL MAJOR FUNCTIONS OF THIS MODERN LATHE ARE CONTROLLED FROM THE OPERATOR'S POSITION AT THE CARRIAGE.

Among Heavy Machine Tools built by Consolidated are . . . .

LATHES
BORING MILLS
DRILL PRESSES
MILLING MACHINES
BORING MACHINES
COLD SAW MACHINES
BORING, DRILLING AND MILLING MACHINES
DRILL AND TOOL GRINDERS
PLANERS
SLOTTERS
RAILROAD SHOP TOOLS
AUTOMOTIVE TOOLS
AND OTHER SPECIAL MACHINES

- Wide speed range permits use of either high speed steel or carbide tools.
- Feed and traverse functions entirely independent of thread cutting mechanism.
- Feed rate and cutting speed, within the range of their respective motors, are adjustable independently without interrupting the cut.
- Lead screw for thread cutting only.
- All anti-friction bearing headstock.
- Hardened steel bedways.
- Main drive motor speeds and feed and traverse functions are conveniently controlled from the operator's position at the carriage.

- Altogether, this modern lathe embodies the advanced features necessary to meet today's demand by industry for high production with greater accuracy and durability. Full information on this lathe or other Betts-Bridgeford Heavy Duty Lathes from 26" to 144" and larger will be furnished upon request.

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848

BETTS • BETTS-BRIDGEFORD • COLBURN • HILLES & JONES • MODERN • NEWTON • SELLERS

CONSOLIDATED MACHINE TOOLS

CONSOLIDATED
MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

Designer's

Standard motors can be foot-, sidewall-, or ceiling-mounted for a wide variety of applications. Wherever they can be used, they are less expensive and can be shipped sooner than special motors. Installation is quick and easy, and they can often be shifted from one job to another in an emergency.

MOTOR MOUNTINGS FOR EVERY MACHINE

—to simplify your design job!

One of the big time-saving advantages of Tri-Clad induction motors for designers today is the wide variety of motors and motor modifications available in the line. You can literally specify one for almost every conceivable type of mounting —usually right out of the catalog—that will simplify your design job, save space, and cut assembly costs.

This versatility of mounting is basic with both the open (drip-proof) and the popular totally enclosed lines, each comprising a wide range of ratings. Where the motor is to become a part of your machine, a Tri-Clad motor mechanical modification—like the few shown below—can improve appearance, add convenience, and save space and weight.

And because they're all Tri-Clad motors, you have industry-proved 3-way extra protection—against physical damage, electrical breakdown, and operating wear and tear. For the "inside story" on Tri-Clad motor toughness, see Bulletin GEA-3580.

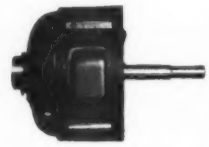
TRI CLAD
REG U S PAT OFF.

INDUCTION MOTORS

Face-type motors are used where motor supports machine, by means of bolts which screw into tapped holes in motor's end shield. Supplied with or without feet.

Flange-type motors are for use where machine supports motor, attached by bolts tightened from motor side of end shield's mounting surface. Supplied with or without feet.

Vertical motors are for direct coupling to vertical machine shafts. The Type P base conforms to NEMA standard dimensions.



Partial motors, built right in or closely coupled to the machine, are supplied less one or more components—end shields, bearings, shaft.

GENERAL ELECTRIC

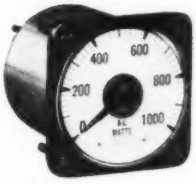
Digest

PRODUCT HIGHLIGHTS

MANUAL SWITCHES
—for simplest motor-starting!

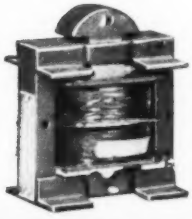
As easy to use as a home light switch is this General Electric manual motor-starting switch. Available with overload protection in both push-button and toggle-operated types, it's the simplest way to control infrequently started small motors. Mounting and wiring are simplified, too, because of front-connected terminals, easy-to-reach knockouts, roomy case. For 1 to 7½ hp, 1-, 2-, or 3-phase a-c motors, or for d-c motors up to 2 hp. See Bulletin GEA-1522.

SWITCHBOARD INSTRUMENTS
—long scale and shadow-proof!



Newly designed shadow-proof covers on these G-E long-scale switchboard instruments now make possible quick, accurate readings even under sharp-angle lighting conditions. They are enclosed in dust-tight, moisture-resistant cases designed for semi-flush mounting and reduced behind-the-panel depth. You can obtain these shadow-proof instruments as ammeters, voltmeters, and wattmeters; frequency and power-factor meters; temperature indicators and synchroscopes in either 4¼- or 8¾-inch sizes—all accurate to ±1 percent. See Bulletin GEC-218B

HEAVY-DUTY SOLENOIDS
—for precision push or pull!



When your machine needs a straight-line push, pull, or reciprocating motion, you'll get a reliable, precision job with General Electric heavy-duty solenoids. Designed especially for long life in industrial service, they're available in a complete line, continuously rated, for a-c or d-c. Ratings range from a ¾-inch stroke at 0.65-lb thrust to 3-inch stroke with a thrust of 97 pounds. Ratings and full description, plus condensed data on how to select a solenoid, are contained in Bulletin GEA-5163.

Wall-mounted type (above) comes in ratings from ¾ to 7½ kw.

Floor-mounted type (right) is available in 10- to 25-kw ratings.

NOW...

PACKAGED METALLIC-RECTIFIER POWER SUPPLIES

. . . for easy specifying, fast installation, low maintenance, flexible operation!

Here is a line of packaged a-c to d-c conversion units that's easier to specify and install, lowers unit costs, and speeds shipments. Made up of standard subsections, unit comprises selenium rectifier stacks, insulated transformer with taps to adjust for 10 per cent line voltage variation, and optional auxiliary control—all mounted in a metal enclosure. For flexibility or added capacity, two or more units can be placed in series or in parallel. Absence of moving parts (except for fan-cooling in larger units) cuts need for maintenance. See new Bulletin GEA-5658.

General Electric Company, Section G 665-90
Schenectady 5, New York

Please send me the following bulletins:

- ☐ for reference purposes
- ☐ in connection with immediate projects

  - ☐ GEA-1522 Manual motor-starting switches
  - ☐ GEA-3580 Tri-Clad induction motors
  - ☐ GEA-5163 Heavy-duty solenoids
  - ☐ GEA-5658 Metallic-rectifier power supplies
  - ☐ GEC-218 Switchboard instruments

CONSULT YOUR McGRAW-HILL ELECTRICAL CATALOG FOR PRODUCT ENGINEERS! You'll find "everything electric" for machinery manufacturers in the General Electric section.

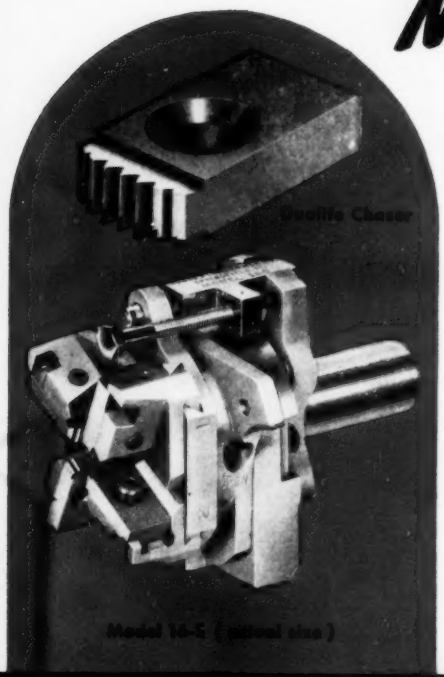
NAME_____

COMPANY_____

STREET_____

CITY_____ STATE_____

NEW Nos. 16-S, 18-S, and 19-S Jones & Lamson Die Heads



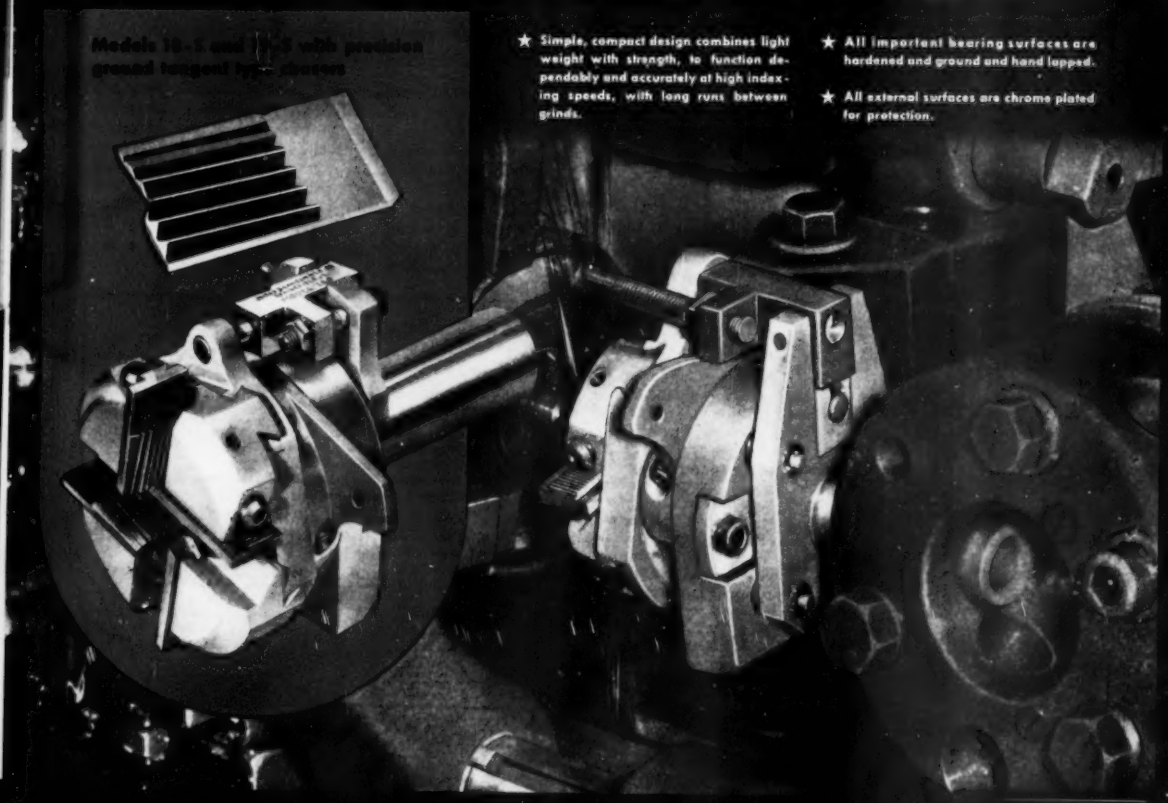
Model 16-S (actual size)

Designed and built for high production quality threading, these new J&L dies perform with smooth, easy action, unusual repetitive accuracy, and year 'round dependability at low cost. They will give you maximum productive machine hours each day.

No. 16-S is for use on No. 00 and 00G and No. 0 and 0G Brown & Sharpe Automatics and small turret lathes. It uses long wearing ground thread, radial type chasers *with two cutting edges.* These DUALIFE chasers are easily and quickly removed and replaced in their holders. When one edge wears out, just turn them over, and you have the equivalent of a new set of chasers. Minimum down time and maximum production result.

No. 18-S and 19-S Model 18-S is for use on No. 0, 0G and No. 2, 2G Brown & Sharpe Automatics. Model No. 19-S with wider capacity range, is for use on No. 2, 2G Brown & Sharpe machines. Both are also used on small turret lathes. They have Tangent type chasers, ground all over, incorporating the exact helix angle and thread form. They are easily removed and replaced without disturbing the head and holder assembly. Many of these chasers are interchangeable between the two models and other standard J & L Tangent Die Heads. Carbide chasers can be used when conditions permit.

for Brown & Sharpe Automatics and Small Turret Lathe Applications



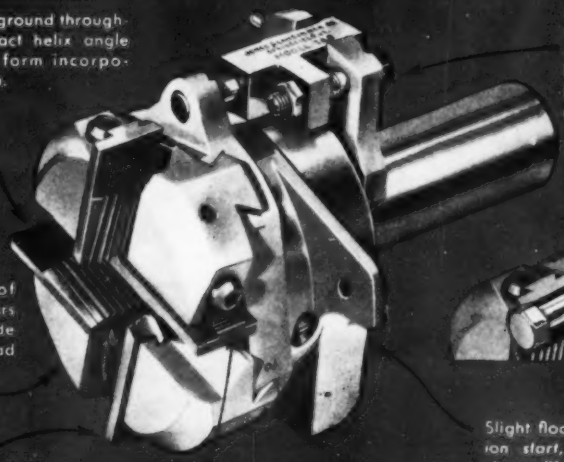
★ Simple, compact design combines light weight with strength, to function dependably and accurately at high indexing speeds, with long runs between grinds.

★ All important bearing surfaces are hardened and ground and hand lapped.

★ All external surfaces are chrome plated for protection.

No. 18-S (actual size)

Chasers are ground throughout; with exact helix angle and thread form incorporated in each.



Adjustable Trip, quickly converted for either PULL OFF or EXTERNAL TRIP. Easy, quick opening prolongs both chaser and die life, increases runs between grinds.

One set of chaser holders handles a wide range of thread sizes.

Leading edge of chasers extends beyond face to permit threading close to shoulders.

Chasers can be changed and set quickly, easily and accurately. A few turns of a *single* screw will release or secure each chaser in its holder.

Slight float provides cushion start, helps prolong chaser life.

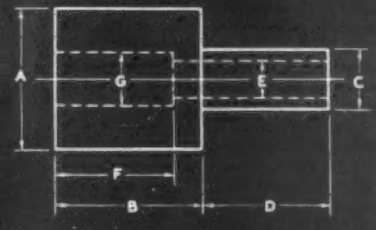
All three models can be furnished with a lever locking handle, for use on small turret lathes.

Specifications for Nos. 16-S, 18-S, 19-S Jones & Lamson Die Heads

DIE NO.	CAPACITY	THREAD LENGTH	
16-S	No. 0 through 3/8" (Coarsest standard Pitch-18 TPI)	No. 0 through 3/8" dia.	Any length
18-S	No. 4 through 9/16" (9/16" holders Coarsest standard Pitch-12 TPI)	On No. 0 & 00 B & S machines	
		No. 4 through 7/16" dia.	Any length
		Over 7/16" through 9/16" dia.	Max. length 1-7/8"
		5/8" dia.*	Max. length 1"
		On No. 2 & 2G B & S machines	
		No. 4 through 9/16" dia.	Any length
		5/8" dia.*	Max. length 1-1/8"
19-S	No. 4 through 9/16" (9/16" holders Coarsest standard Pitch-12 TPI)	No. 4 through 9/16" dia.	Any length
	5/8" through 1" (1" holders Coarsest standard Pitch-10 TPI)	5/8" dia.	Any length
		Over 5/8" through 1" dia.	Max. length 2-1/4"
	7/8" through 1-1/4" (1-1/4" holders Coarsest standard Pitch-12 TPI)	7/8" through 1" dia.	Max. length 2-1/4"
		Over 1" through 1-1/4" dia.	Max. length 1/2"

*For special application only

DIE	B & S GAGE	A	B	C	D	E	F	G
16-S	No. 00-000	5-5/16	1-31/32	5/8	1-1/4	13/32	13/16	15/16
	No. 0-00	5-5/8	2-21/32	3/4	2-1/2	13/32	13/16	15/16
18-S	No. 0-00	5-5/8	2-17/32	3/4	2	15/32	2	19/16
	No. 2	5-5/8	2-27/32	1	2-1/2	19/32	1-1/4	21/32
19-S	No. 2	5-7/8	2-27/32	1	2-1/2	41/64	2-1/8	2-1/2



Write for catalogs describing our complete line of Tangent Dies up to 2" dia. capacity, and Radial Dies up to 4¼" dia. capacity.

Die Head Division

JONES & LAMSON

MACHINE COMPANY

Springfield, Vermont, U.S.A.

MACHINE TOOL CRAFTSMEN SINCE 1835

....the "BIG BOOST" in tooling....

From "The Osbornite" published by and for the Employees of the Osborn Manufacturing Company, Cleveland, Ohio.

Chuck Corwin reads greeting card rigged up by co-workers on his new Bullard Cutmaster.

Quality, Production, Get Big Tooling Boost

How would you like to get a 16-ton Christmas present? That's what happened to Chuck Corwin (Machine Shop). Such a gigantic piece of equipment was this gift, that Chuck decided he'd have to leave it here at the plant where he could enjoy it during the day's working hours.

Now 32,000 pounds worth of heavy machinery is a very unusual kind of Christmas present for one man, but in the case of Chuck's new machine – the big 36" Bullard Cutmaster, all of us can get a lot out of it in more ways than one.

Installation of this major piece of plant machinery can be counted on to consolidate more firmly our ability to produce more. It can handle tooling of larger parts than we have been able to make up to now so it will increase the scope and range of the Moulding Machines we can sell to our customers. And that, in turn, certainly benefits us all.

Without getting too technical, we'd like to tell a little about what this new Bullard can do and how it does it. First, let's take that designation, "36". It refers not to the size of the machine itself, for anyone can see that it takes up space from the floor almost to the ceiling of the Machine Shop. Thirty-six inches refers simply to the size of the working table on which the machinist tools his metal. This Bullard will turn, bore and face Moulding Machine parts at speeds ranging from four revolutions per minute all the way up to 210 r.p.m. You can have two tools in work at one time on this mill by using the side jack and the turret head simultaneously.

Yes, we can all expect great things from this Bullard Cutmaster which, incidentally is the third such mill to be installed recently. One of the others has a 54" table for tooling even bigger parts for our Moulding Machines. All are controlled in the hydraulic system by solenoid action, and accommodate the newest type carbide tooling.

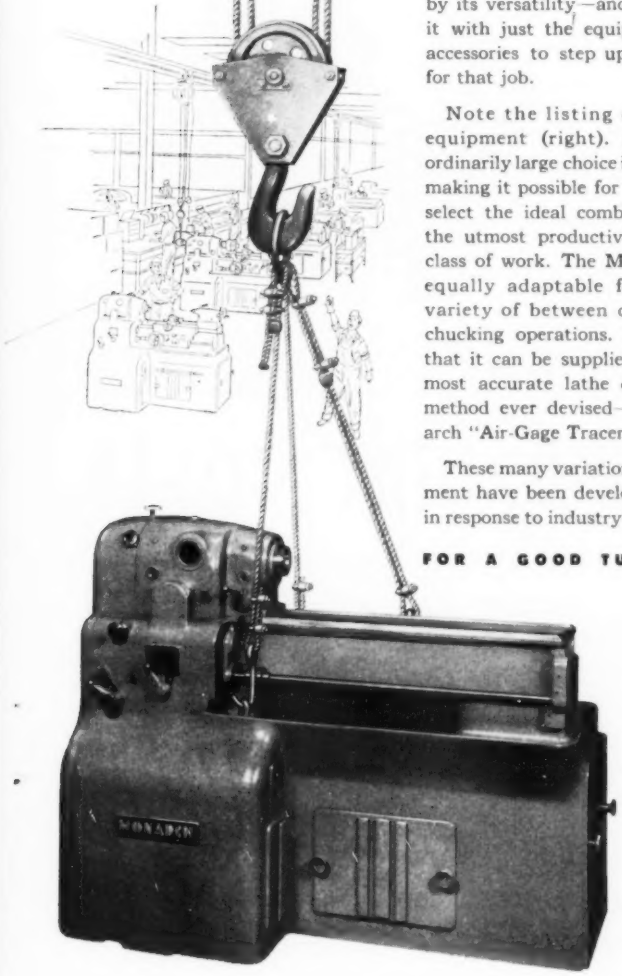
THE BULLARD COMPANY
BRIDGEPORT 2, CONNECTICUT

Here's Where *You* Come In!

That's right—from here on you can just about write your own ticket! Think of the most exacting assignment for small lathes anywhere along your production lines. Then tell us about it. We'll deliver a high-speed, sensitive Monarch 10″ Model EE—a lathe with an inbuilt productivity matched only by its versatility—and you'll get it with just the equipment and accessories to step up standards for that job.

Note the listing of typical equipment (right). An extraordinarily large choice is available, making it possible for the user to select the ideal combination for the utmost productivity on *his* class of work. The Model EE is equally adaptable for a wide variety of between center and chucking operations. Note, too, that it can be supplied with the most accurate lathe duplicating method ever devised—the Monarch "Air-Gage Tracer."

These many variations in equipment have been developed solely in response to industry's demands that we make the basic Model EE design available for constantly widening uses. Could anything we say speak better for its design and specifications? Some place—*many* places, perhaps—this outstanding Monarch lathe can improve your production at lower cost. Send the coupon today for full details . . . . . *The Monarch Machine Tool Company, Sidney, Ohio.*



TYPICAL EQUIPMENT

- "Air-Gage Tracer"
- Steady rest
- Follow rest
- Taper turning attachment
- Collet attachments
- Air equipment
- Bar feed attachments
- Collet chucks
- Jaw chucks
- Step chucks
- Stops
- Micro-gaging diameter dial
- Hexagon power feed bed turret
- Hand operated cut-off slide
- Variable feed control
- Ball turning rest

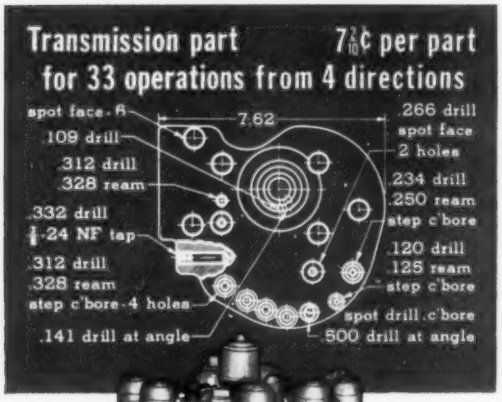
FOR A GOOD TURN FASTER . . . TURN TO MONARCH

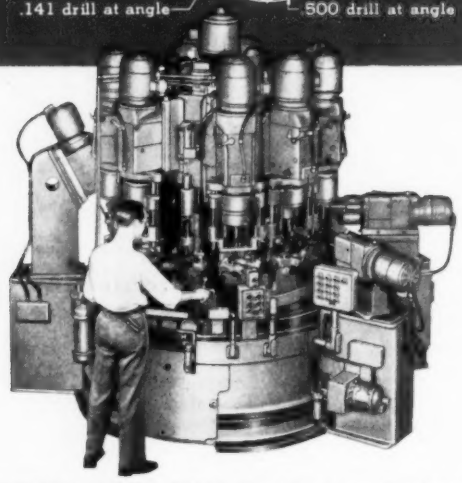
Monarch
ACCURACY • ECONOMY • LONG LIFE
TURNING MACHINES

THE MONARCH MACHINE TOOL CO., Sidney, Ohio

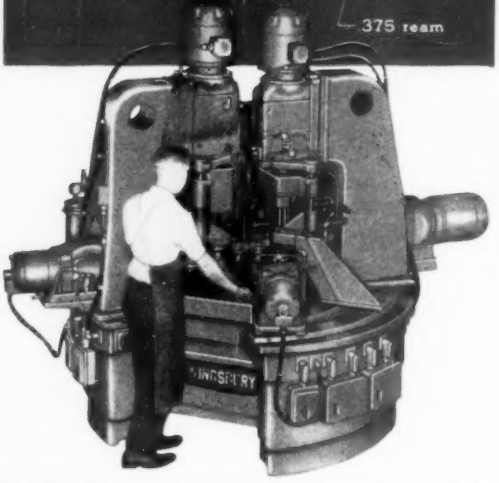
Gentlemen:
Please send me without obligation your Booklet No. 1003 covering the Monarch Precision Manufacturing Lathe—Model EE. *(It's that new one with 28 pages and a host of those sparkling Monarch illustrations.)*

NAME _____
COMPANY _____ TITLE _____
ADDRESS _____
CITY _____ ZONE ____ STATE _____





185 PARTS AN HOUR GROSS. This 60-inch power indexing machine has 12 stations. Eight vertical units mounted on the central column operate 28 tools. Two angular units drill .141 and .500. Two horizontal units drill .109 and .332 and tap 7/16-24.



970 PARTS AN HOUR GROSS. Twelve fixtures on a 20-inch power index table rotate 120° with each index. Four horizontal units drill and tap the peripheral holes. Three vertical units do the ten axial holes. Clamping and unclamping are automatic.

Amazingly low unit costs

Any way you figure it, Kingsbury machines save money on accurate high-production drilling and tapping operations

Dear Sir:

Here is the average cost of the man and machine for each *operation* shown in the drawings:

Transmission part	22/100¢
Telephone part	3/100¢
Generator part	7/100¢
Typewriter part	10/100¢

One reason these costs look good is that they include just the man and machine — no power or overhead. But there is no tricky figuring. In fact, we think the basis is quite conservative. We assumed:

1) 80% efficiency;

2) a wage rate equal to today's national average;

3) a pay-off period of 6000 hours of production — about a year with three shifts or three years with one shift, a fraction of the useful life.

The unit cost on each drawing is the sum of these two figures —

The unit cost of the man:

$$\frac{\text{average U. S. hourly wage}}{\text{hourly gross x 80\% efficiency}}$$

The unit cost of the machine:

$$\frac{\text{price of tooled machine}}{\text{output in 6000 hours @ 80\% efficiency}}$$

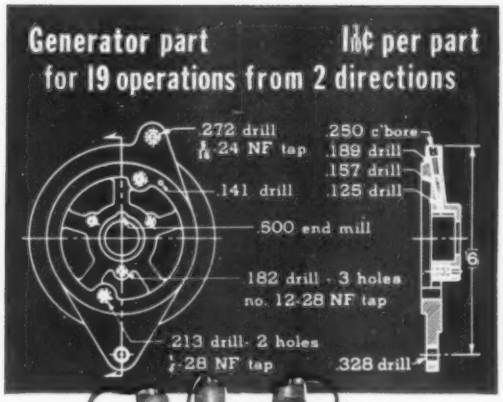
You can use actual figures

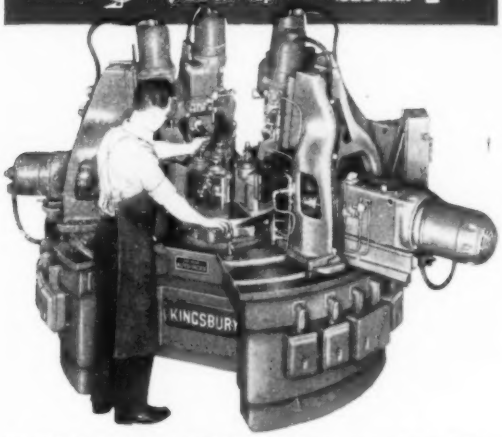
We hold no brief for our assumptions, but we had to assume *something*. The pay-off period is 6000 hours because most Kingsburys do pay for themselves in one to three years.

If you want to know if a Kingsbury would be a good investment for you, ask us for a proposal. Then figure your unit costs in your own way using your own figures. Even a rough calculation may convince you.

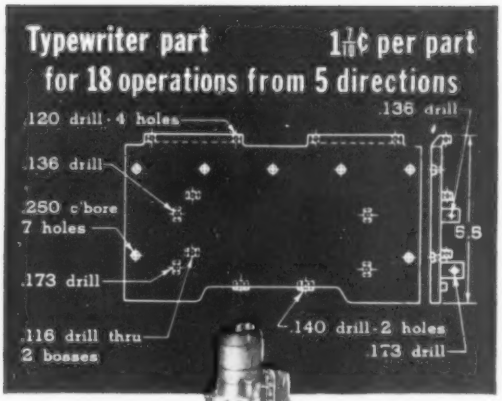
Meeting close tolerances

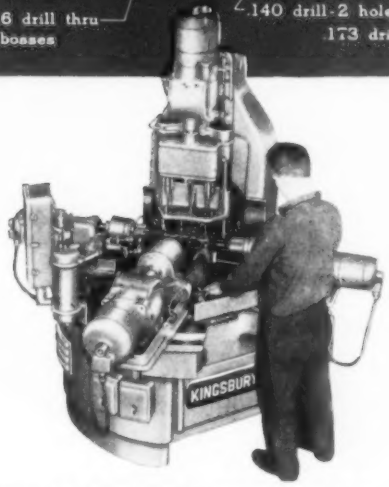
Savings alone don't sell Kingsburys. Other high production machines may match our costs. But how about the quality of the finished parts? In all





430 PARTS AN HOUR GROSS. A 20-inch power index table has five fixtures. At the four working stations four horizontal units do the holes in the left view and four units on tunnel columns do the oil hole. Three units have multi-spindle heads.





280 PARTS AN HOUR GROSS. Put one piece in the fixture and trip a lever. The vertical unit clamps it and counterbores seven holes. Then horizontal units operate on four sides. When the clamp withdraws, remove the piece. There is no indexing.

on 4 high production jobs

humility we feel that in this type of work no equipment excels ours. That is just our opinion, of course, but it is an honest one.

Bushings guide drills and reamers accurately. We locate spindles to exact indicator readings and run them in precision ball bearings.

Each index table and its fixtures are jig-bored to minimum tool room tolerances. Each fixture is rugged and grips the part firmly without distortion. The locating points conform to your specifications.

We're not in the back woods

Some people who visit us for the first time are surprised at the quality of our equipment and our work. Maybe they just don't expect much from people in the New Hampshire hills. Actually we are right between the machine tool centers of Worcester, Mass. and Springfield, Vt.

Our shop has three acres of floor space, 122 machines under ten years old and employs 316 people with a combined length of service of 3257 years. We have 11 jig-borers and nine boring machines, mostly in a windowless air-conditioned building with strict control of temperature and humidity.

If you are ever up in these parts and have high production drilling and tapping problems, we hope you will stop in and see us. We make a lot of friends that way.

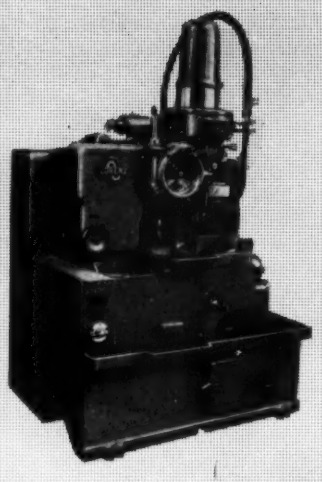
Sincerely,

Kingsbury Machine Tool Corp.
95 Laurel St., Keene, N. H.

KINGSBURY

AUTOMATIC DRILLING & TAPPING MACHINES
for Low-Cost High Production

DIE VIER - K'NE

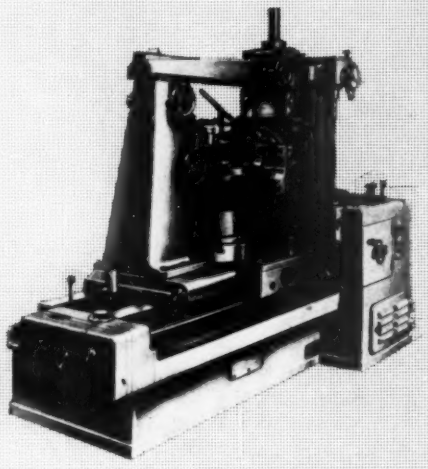


SV 00

AUTOMATIC HIGH-SPEED
GEAR SHAPERS
FOR CUTTING EXT. AND
INT. SPUR AND HELICAL GEARS

AUTOMATIC HIGH-PRODUCTION
GEAR HOBBERS
GREATEST ACCURACY
CONVENIENT OPERATION

E 9

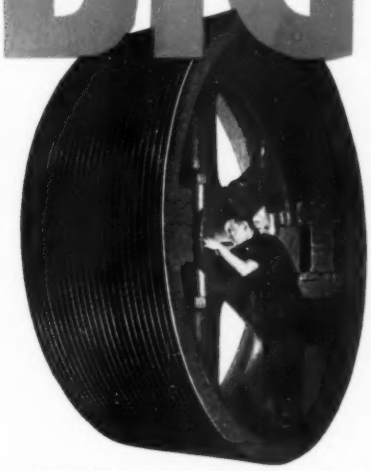


LORENZ

MASCHINENFABRIK LORENZ AG
ETTLINGEN/BADEN · GERMANY

BIG or Small

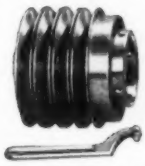
...EVERYTHING IN V-BELT DRIVES!



NON-STOCK SHEAVES — These sheaves are made to order from stock patterns for A, B, C, D, or E belts, 1 to 1000 hp. For further information check with your *Texrope* drive dealer or Allis-Chalmers Sales Office.

TEXROPE
Greatest Name in V-Belt Drives

***SUPER-7* V-BELT** — Famous grommet construction. No splices where failure can start. Rubber cushion supports rayon cord at pitch line. Sizes and sections to suit all operating conditions. All Standard sizes from stock.

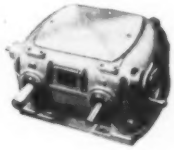


***VARI-PITCH* STANDARD SHEAVE** — Speed range of 9% to 28% on drives of 1 to 300 horsepower, using A, B, C, D, or E belts. Two to 10 grooves. These sheaves are available in either motion control or stationary control.

AUTOMATIC *VARI-PITCH* SHEAVES — Offer stepless speed control . . . one to 40 hp . . . 2 to 1 speed range. Move motor forward to increase speed, and back to decrease. One hand does it while motor is running.

***MAGIC-GRIP* SHEAVES**— Fastest mounting sheave you can buy. Aligns easily . . . cannot shake loose. 1 to 12 grooves for A-B, B, C, and D belts. 1 to 250 hp. Stocked in many cities for immediate delivery.

***TEXSTEEL* SHEAVES** — Pressed steel sheaves for applications from ¼ to 25 horsepower. Light weight and rigid. 1 to 6 grooves, A or B belts. All sizes and bores are available for delivery from stock.



***VARI-PITCH* SPEED CHANGER**—Smooth, accurate speed control at turn of hand wheel. Machines operate at exactly the speed for best production. Stepless speed range: 3¾ to 1. Capacity: 1½ to 75 hp.

YOU CAN GET every V-belt drive component from the *Texrope* line: Constant speed drives; standard and wide range *Vari-Pitch* drives; speed changers; motor bases; and new or replacement long lasting *Super*-7 V-belts.

Get Added Benefits

In addition, you get extra engineering skill both in the field and factory that comes from having more industrial V-belt installations than any other manufacturer.

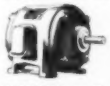
The world's greatest store of V-belt engineering knowledge has been condensed into a 120 page *Texrope* Pre-Engineered Drive Book. Covers 90% of all V-belt drive requirements. Ask your Allis-Chalmers Authorized Dealer or Sales Office for Bulletin 6956A, or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-3272

***Texrope, Super-7, Vari-Pitch, Texsteel, and Magic-Grip* are Allis-Chalmers trademarks.**

ALLIS-CHALMERS

Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.



MOTORS — ½ to 25,000 hp and up. All types.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

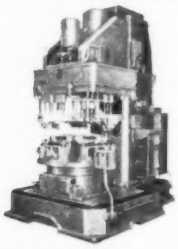
PUMPS — Integral motor and coupled types from ¾ in. to 72 in. discharge and up.

NATCO OFFERS

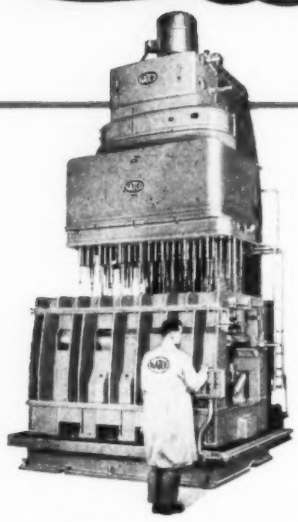
50 Years Experience

IN BUILDING A COMPLETE RANGE OF DRILLERS, BORERS, FACERS AND TAPPERS

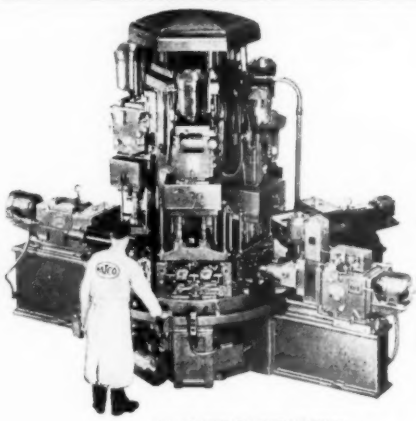
NATCO LIGHT SENSITIVE DRILLER AND TAPPER



NATCO HOLESTEEL ADJUSTABLE DRILLER AND TAPPER



NATCO HEAVY DUTY HOLESTEEL DRILLER



NATCO STATION TYPE MACHINE

Out of the past fifty years of NATCO experience has come a deeper understanding of today's engineering and production problems. By reason of this maturity of understanding the NATCO organization is better equipped to help you solve your drilling, boring, tapping and facing problems. Better equipped with experienced engineers and designers. Better equipped with the most complete range of adjustable and fixed center multi-spindle machines in the world.

A few of the various NATCO machines are illustrated above. As you can see they range from small, fast, light-sensitive multi-drillers and tappers to large automatic processing machines . . . from single spindle to an unlimited number of spindles, from one direction to any number of directions, vertical, horizontal or angular, special or standard and operations range from 1/16" drill to 14" or larger bore. The materials worked include iron, steel, bronze, aluminum, wood and plastic.

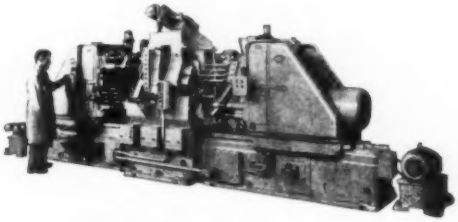
NATIONAL AUTOMATIC TOOL COMPANY, INC., Richmond, Indiana

NATCO HIGH SPEED SENSITIVE DRILLER AND TAPPER

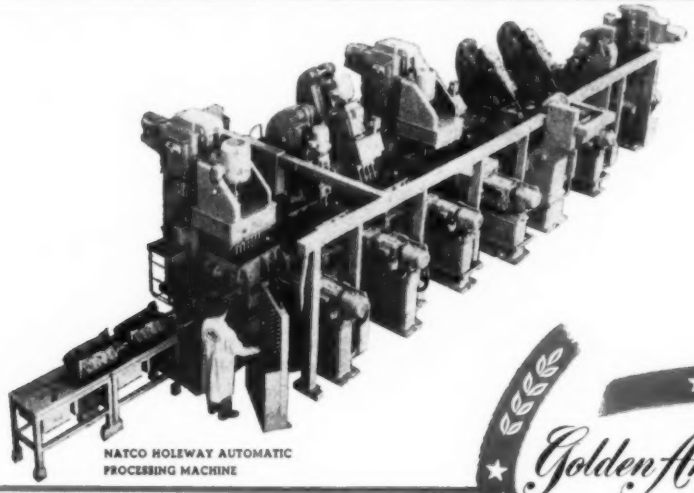
NATCO HIGH SPEED SENSITIVE UNIT

NATCO ONE-WAY TURNING BORING AND FACING MACHINE

NATCO THREE-WAY TAPPER WITH INDIVIDUAL LEAD SCREW



NATCO THREE-WAY TRUNNION TYPE DRILLING MACHINE



NATCO HOLEWAY AUTOMATIC PROCESSING MACHINE

Golden Anniversary

1901 NATCO 1951

Today NATCO offers you not only fifty years experience and ample production facilities but also several branch offices conveniently located to serve you in Detroit, Chicago, Buffalo and New York City.

To solve your problems in drilling, boring, facing and tapping most economically . . . Call a NATCO Field Engineer Today!

Branch Offices

Biggest Name in Vacuum Bottles

USES K·R·WILSON PRESS

No doubt about it! The "Thermos" bottle is as familiar to the American scene as the illustrious hot dog. And our good customer, American Thermos Bottle Co., uses a K. R. Wilson Hydraulic Press in producing thousands of these famous "hot coffee containers" every year.

Tool boxes, skis, gas tanks, glove compartments in cars, even milady's cold cream . . . these and hundreds of other products are processed somewhere along the line on KRW presses. If there's a place in *your* manufacturing operations for Hydraulic Presses, you'll save money and cut production costs with KRW. Available in 25 - 150 ton capacities, K. R. Wilson presses are self contained completely above ground. In many cases, the cost of a KRW press has been less than the foundation cost of heavier mechanical equipment recommended for the same job. One, two and three cylinder models; either hand-operated, air-operated or motor driven; vertical or horizontal ram travel. If you need a specially built press to do a special job, let us know. We'll engineer one to your specifications.

K·R·WILSON

215 Main Street - Buffalo 3, N. Y.

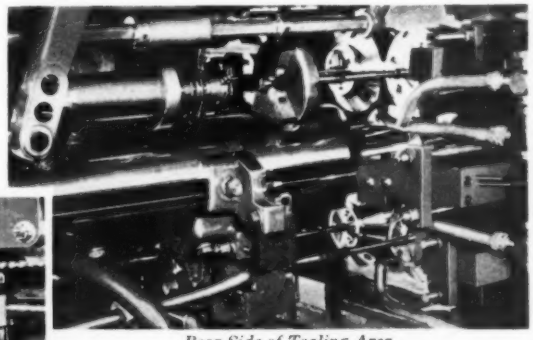
• Ask your machinery dealer to quote you . . . or write or wire Dept. 11 for full facts and prices.

Although certain types of shaft jobs offer natural opportunity as bar machine work, with the exception of the CONOMATIC, seldom do they appear on multiple spindle bar automatics. In general, shaft jobs require a longer tooling area than do other types of bar work.

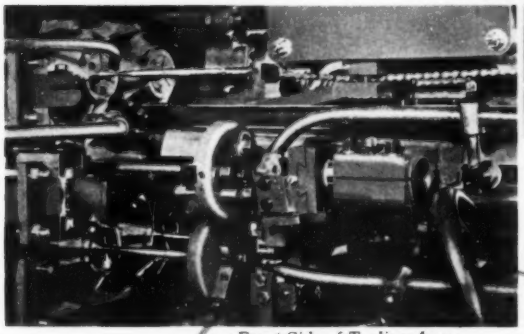
A glance at the frame design of the CONOMATIC explains why its tooling area is longer* than the tooling areas of other "automatics." And there are more tool positions* and more room* for tool setting for *any* type of job.

*You can have the figures

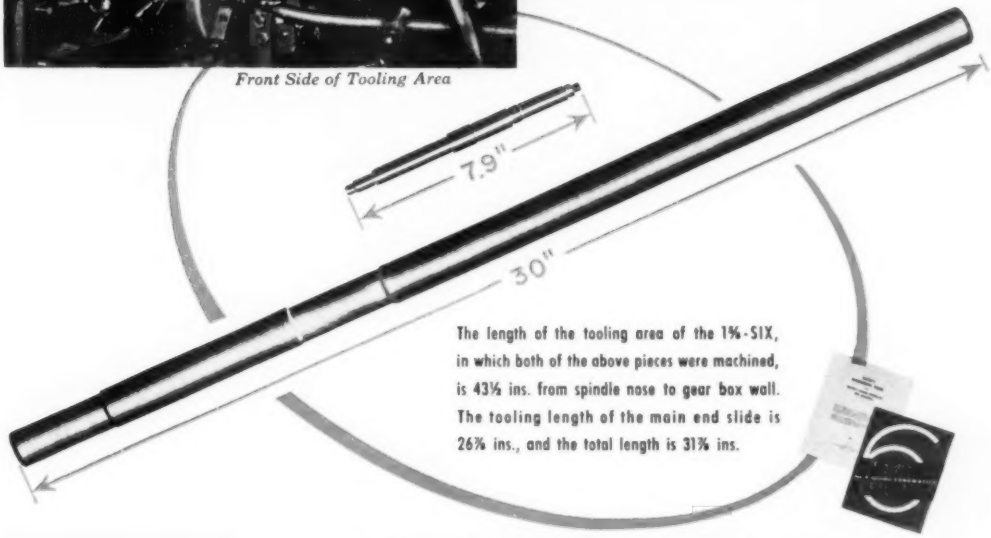
THERE'S *More* THAN JUST *"Elbow Room"*



Rear Side of Tooling Area

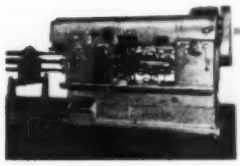


Front Side of Tooling Area



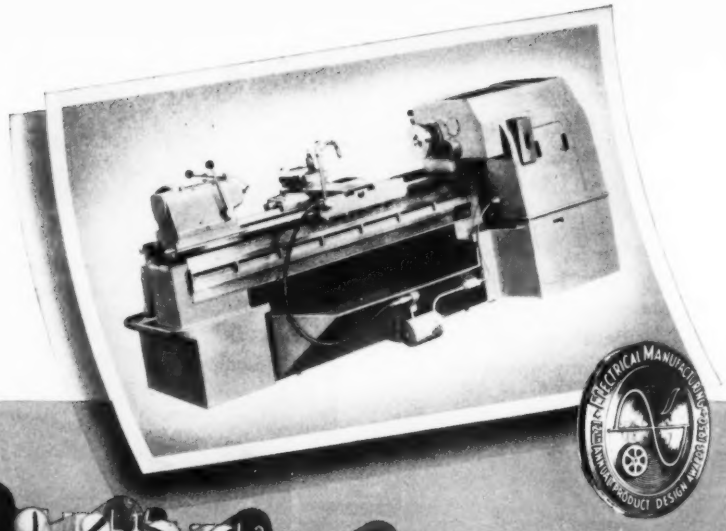
The length of the tooling area of the 1¾-SIX, in which both of the above pieces were machined, is 43½ ins. from spindle nose to gear box wall. The tooling length of the main end slide is 26⅞ ins., and the total length is 31⅞ ins.

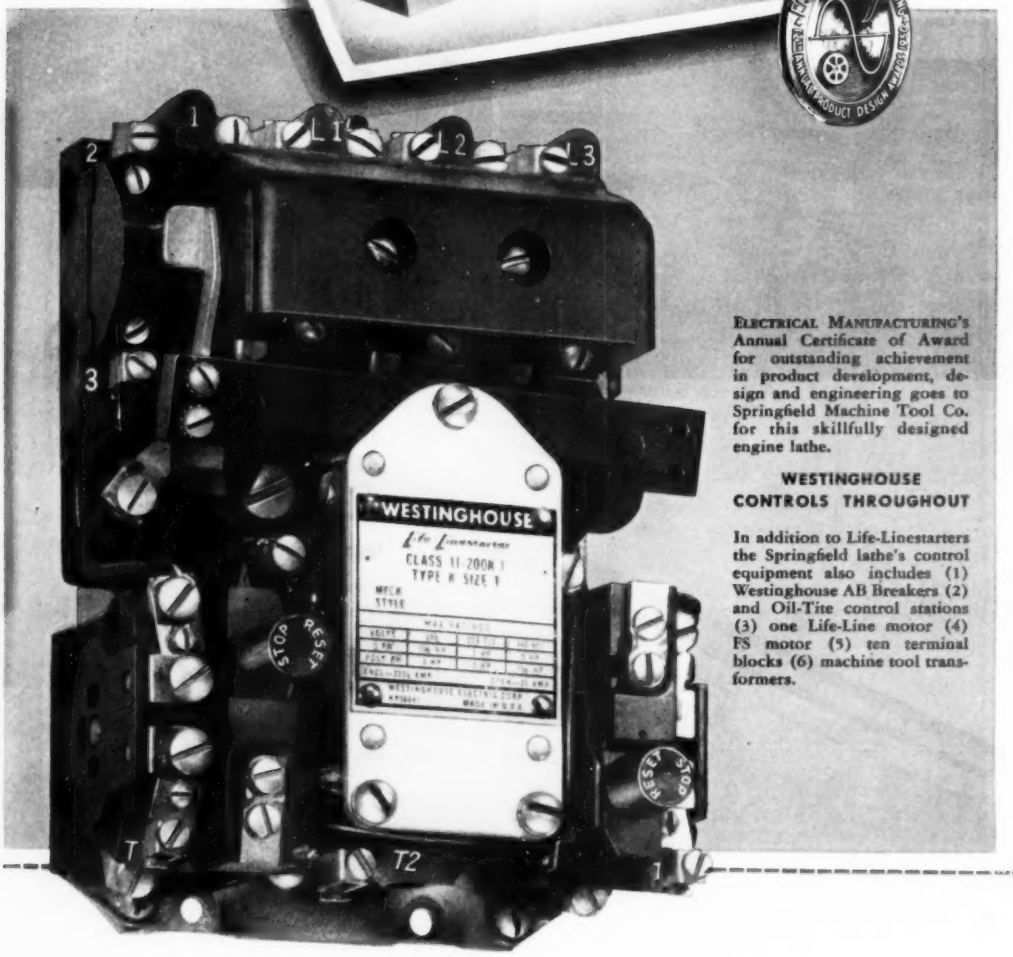
A Comparison of ALL Automatics is in favor of Cone



Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC.
WINDSOR, VT., U.S.A.





ELECTRICAL MANUFACTURING's Annual Certificate of Award for outstanding achievement in product development, design and engineering goes to Springfield Machine Tool Co. for this skillfully designed engine lathe.

WESTINGHOUSE CONTROLS THROUGHOUT

In addition to Life-Linestarters the Springfield lathe's control equipment also includes (1) Westinghouse AB Breakers (2) and Oil-Tite control stations (3) one Life-Line motor (4) FS motor (5) ten terminal blocks (6) machine tool transformers.

Prize Winner!

Life-Linestarters are integral equipment on award-winning Springfield lathe...

The selection of Life-Linestarters® for this application points up advantages which also represent design opportunities for you. For example, Springfield engineers aimed at . . .

Economy of space. The Life-Linestarter's compact design, easy accessibility and straight-through wiring features permitted mounting of starters and associated controls in limited compartment area. Also they demanded . . .

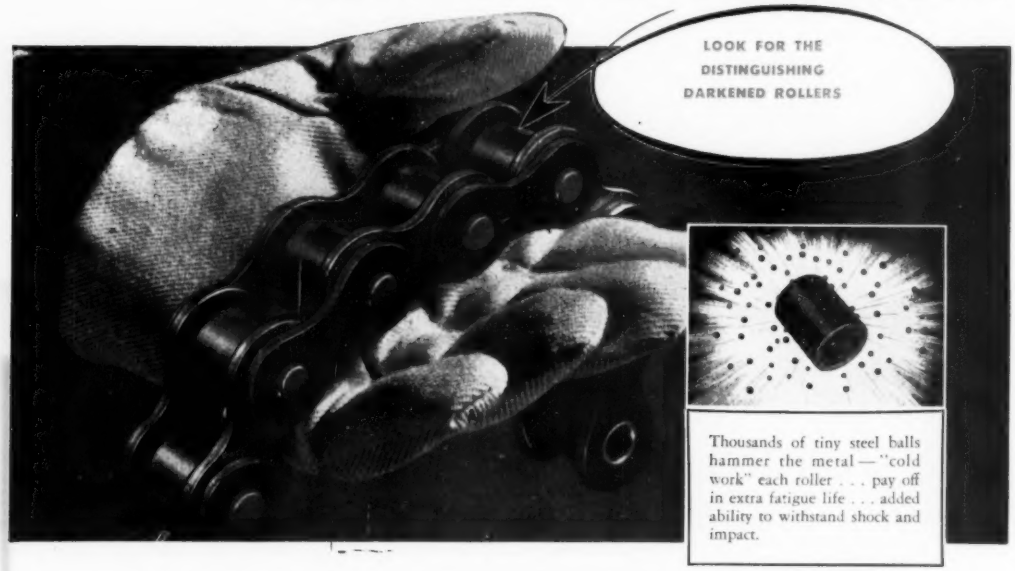
Easy accessibility and maintenance. Here Life-Linestarter's simplified design with all parts front-removable clearly filled the bill. And they wanted . . .

Positive protection. Life-Linestarter's simplified mechanism, together with a bimetallic, snap-action, overload relay assured lasting dependable performance.

When you're looking for reliable protection, incorporated in a compact, easily serviced design . . . Life-Linestarters are *your* answer too. Booklet B-4677 contains complete details; for your copy write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.
J-30050

YOU CAN BE SURE.. IF IT'S
Westinghouse
Life-Line
MOTORS and CONTROLS

Here's how you can tell the chain with SHOT-PEENED rollers...



Thousands of tiny steel balls hammer the metal — "cold work" each roller . . . pay off in extra fatigue life . . . added ability to withstand shock and impact.

...the chain that has extra fatigue life

YES, you want to be sure you get shot-peened rollers on the next roller chain you buy. Shot-peening gives rollers the extra fatigue life needed to take repeated shock and impact loads.

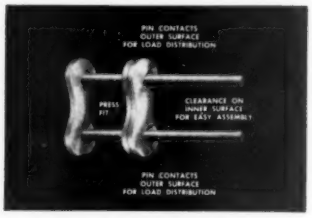
These chains are high in tensile strength, durable under severe loads, relatively light in weight and uniform in pitch. This accounts for their wide acceptance throughout industry for both drive and conveying purposes.

Thanks to constant research and precise manufacturing controls, every Link-Belt Precision Steel Roller Chain meets the highest standards for uniform strength. You get a positive, long-life drive — unaffected by heat, cold or moisture.

Link-Belt Roller Chain is available in single or multiple widths, in $\frac{3}{8}$ to 3 in. single and double pitch. For all the facts, call your nearest Link-Belt office.

LINK-BELT

PRECISION STEEL ROLLER CHAIN



Easier coupling
and uncoupling without sacrificing load distribution

Patented E-Z Assembly feature of Link-Belt Precision Steel Roller Chain has won world-wide approval. Coupling and uncoupling of multiple width chains — right on the job — is far easier. There's absolutely no sacrifice of load distribution . . . no loss of the chain's remarkable performance. Press-fits between chain pins and middle bars have been modified. But full load carrying capacity across the entire width of the chain has been maintained.

LINK-BELT COMPANY: Indianapolis 6, Chicago 9, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices, Factory Branch Stores and Distributors in principal cities. 12.332

HARDINGE
ELMIRA, N.Y.

PERFORMANCE . . . ECONOMY

Collets and Feed Fingers for all makes of Automatics, Chucking Machines and Turret Lathes through a *single* source of supply.

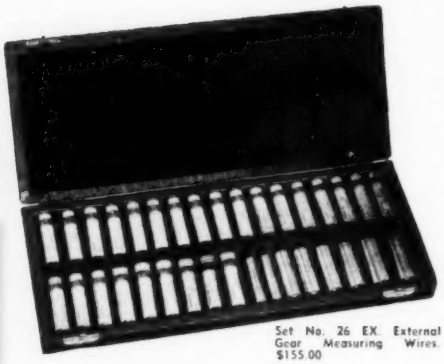
HARDINGE BROTHERS, INC., ELMIRA, N. Y.

ACCURACY *the* EASY WAY...

with the

Van Keuren »»» GEAR MEASURING SYSTEM

Spurs, Helicals, Splines, Serrations



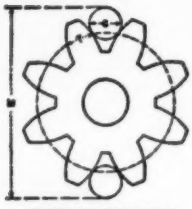
Set No. 26 EX. External Gear Measuring Wires. $155.00

THE Van Keuren Gear Measuring System is generally accepted as the easiest and most accurate method of checking tooth thickness of gears, 30° involute splines and 90° involute serrations. A measurement is made over two opposing wires and this actual measurement is compared with the theoretical measurement over wires for a perfect gear as computed from the Van Keuren tables for 1 diametral pitch gears.

The only equipment required is a set of 2 wires of the proper size for each diametral pitch.

Standard sizes of wires available from stock are:—

1.728" / DP	for extrenal spurs and helicals.
1.44" / DP	for internal spurs and splines.
1.92" / DP	for enlarged pinions, 30° involute splines and 90° involute serrations.
1.68" / DP	Alternate series for special requirements.

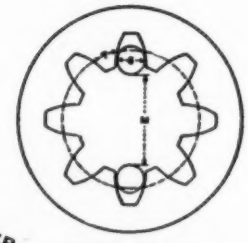


EXTERNAL SPUR GEAR

SIMPLE . . . For spur gears, involute splines and serrations, the only calculation is one of simple division. For helical gears use the simplified computation forms VK-103, VK-104 or VK-105.

RELIABLE . . . The 1.728"/DP System is used by over 90% of American gear producers and users. The 1.44"/DP and 1.92"/DP systems have been incorporated in standards for involute splines and serrations.

ACCURATE . . . The Van Keuren Gear Tables are complete for gears from 5 to 500 teeth and for pressure angles of 14½°, 17½°, 20°, 25° and 30°. If the measurement over the wires is greater than the value calculated from the tables, the tooth is too thick and the cutter must be fed further into the gear blank. Constants for controlling tooth thickness and backlash to .0001" are given for all pressure angles.



INTERNAL SPUR GEAR

MEMBER OF AGMA

CATALOG AND HANDBOOK No. 34

This 208 page volume represents 2 years of research sponsored by the Van Keuren Co.

It presents for the first time in history a simple and exact method of measuring screws and worms with wires.

It tells how to measure gears, splines and involute serrations. It is an accepted reference book for measuring problems and methods.

Copies now free upon request.

THE *Van Keuren* CO., 173 WALTHAM STREET, WATERTOWN, MASS.

32nd YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Plug Gages • Carboloy Measuring Wires

WE'VE CUT YOUR THREADING COSTS—

On Government Orders Like These

Threading tools, times, and tolerances for a long list of parts included in the current government procurement program are ready for you here at Threading Headquarters—the home of Namco Vers-O-Tools.

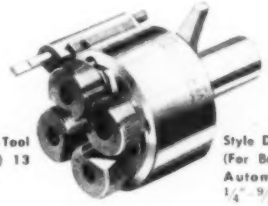
Our engineers have proved these recommendations in production—and our customers are re-proving them in terms of *profit*. They've found that the basic design and construction advantages of the Vers-O-Tool really do pay off.

Take the matter of accuracy: Ground-thread-form circular chasers insure close tolerances and fine finish for the life of the chaser—regrindable through a full 270°. And on some jobs you'll get as many as 100,000 parts between grinds. Direct micrometer check of accuracy after each regrind safeguards sustained production on long runs.

These and many other exclusive Vers-O-Tool features give you a definite competitive edge in bidding on government work. Find out more about them in our catalog D-51. And for specific recommendations on a particular government job, send print or write us direct.

Style DS Vers-O-Tool (Nonrevolving Type) 9 sizes, $\frac{3}{8}$"–$4\frac{7}{8}$".

Style DR Vers-O-Tool (Revolving Type) 13 sizes, $\frac{3}{16}$"–$4\frac{7}{8}$".



Style DBS Vers-O-Tool (For Brown & Sharpe Automatics) 3 sizes, $\frac{1}{4}$"–$\frac{9}{16}$".

The NATIONAL ACME CO.

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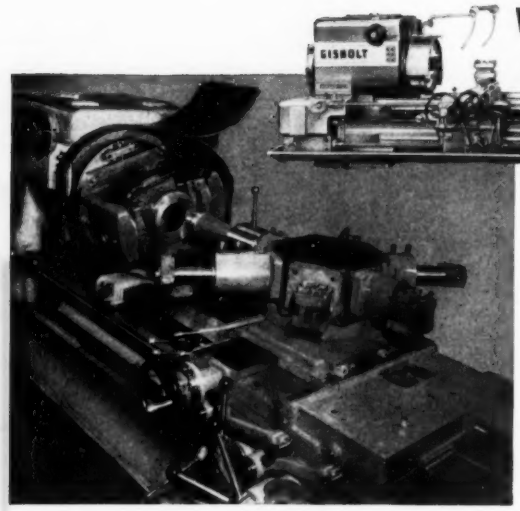
Acme-Gridley 4-6 and 8 Spindle Bar and Chucking Automatics • Single Spindle Automatics • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • The Chronolog • Limit, Motor Starter and Control Station Switches • Solenoids Centrifuges • Contract Manufacturing

Nice work if you can do it...

and you can...

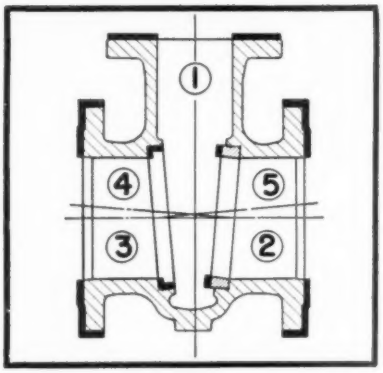
with GISHOLT Turret Lathes...



Gisholt 3L Saddle Type Turret Lathe—one of five sizes for heavy-duty work of all kinds

Straight Machining... Angular Machining and Assembly...

all in one chucking!



Talk about time-cutting ideas, here's the versatility of a Gisholt 3L Saddle Type Turret Lathe paying off again.

All operations required to machine these gate valve bodies are done in a single chucking with a five-position indexing fixture. In addition to machining the bonnet and the two ends, the recesses for the two seat rings are bored and threaded at a five degree angle.

Then the seat rings are inserted—and tightly screwed in place with a driver mounted on the turret. The driving is done with a constant torque—adjustable to suit each job. The final operation is finish facing the seat ring after it is in place with the cross-feeding turret.

Gisholt Engineers have storehouses of ideas to help you increase your production. Ask one to call.

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

THE GISHOLT ROUND TABLE *represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.*

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

Charles Kerins

This man has something for You

He's the factory trained Pratt & Whitney Sales Engineer from your nearby P&W Branch Office . . . an able, alert expert who can give you valuable assistance in obtaining more production from your machine tools, better performance from your cutting tools, and improved control of product-quality from your gages and gaging equipment.

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In addition to our job of producing new Machine Tools, Cutting Tools and Gages to meet defense production requirements, we consider it our responsibility to assist you in obtaining maximum results from your present equipment.

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Dedicated to Accuracy for 91 years

When it comes to production- come to Hartford Special

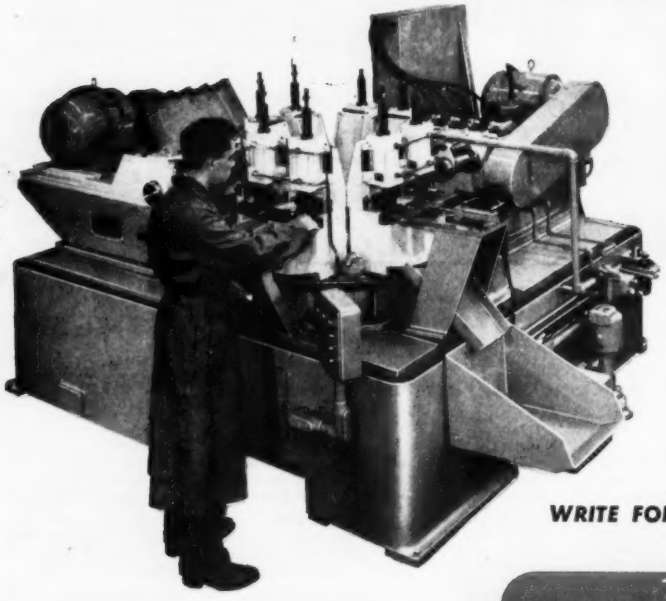
This part has

a production rate of 1280 PCS. PER HOUR

hollow milled from square section and threaded

on this HARTFORD SPECIAL

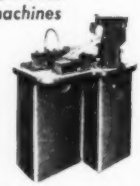
AUTOMATIC DRILLING & TAPPING MACHINE



WRITE FOR BULLETIN NOW!

Hartford Special also makes these production machines

SUPER-SPACERS



Automatic THREAD ROLLERS

DIE POLISHERS

HARTFORD *Special*

...the best buy in the long run

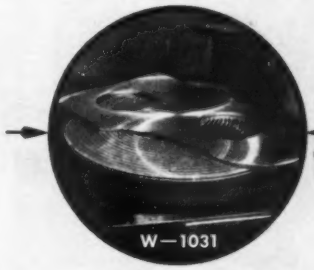
THE HARTFORD SPECIAL MACHINERY CO.
HARTFORD 12, CONNECTICUT

±.0025"

.4365"

17½"

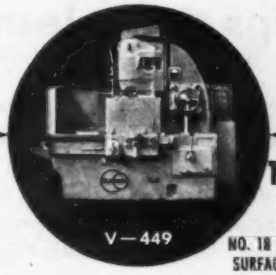
40"



10" dia.

HOW ELSE COULD YOU DO IT SO WELL . . . SO QUICKLY?

Many difficult flat surface machining jobs like this can be done best on a No. 18 Blanchard Grinder. This 3/4" x 24-1/4" x 40" hot rolled steel plate was ground on 2 sides (three operations) to a thickness dimension of .4365" ± .0025" and flat and parallel within .002". Each side was ground in two steps, because the plate overhung the 36" chuck, and the cuts were blended perfectly. 5/32" of stock was removed per side—a total of 57 lbs. of metal was removed in 2-1/2 hours!



10" dia.

NO. 18 BLANCHARD SURFACE GRINDER

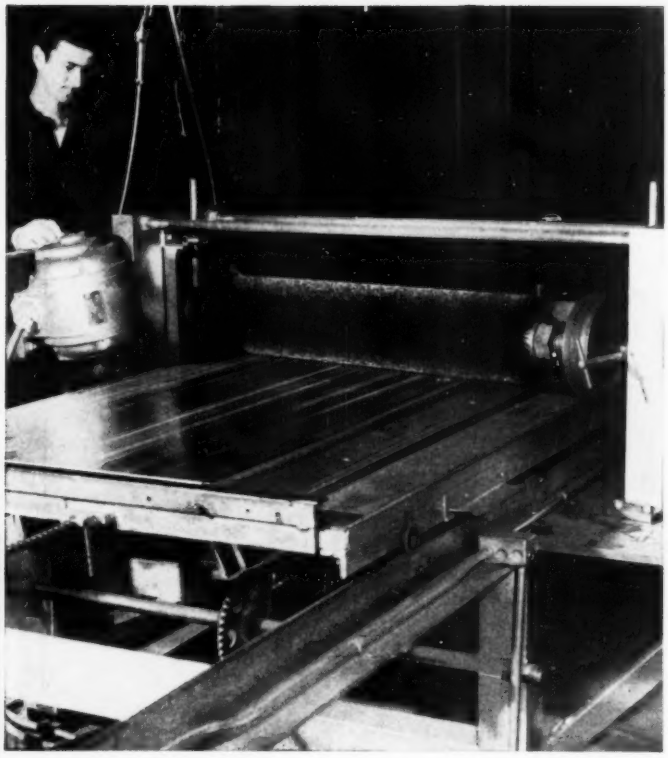
24"

Send for your free copies of "Work Done on the Blanchard," fourth edition, and "Art of Blanchard Surface Grinding."

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY

64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.



THE ALUMINUM DOOR

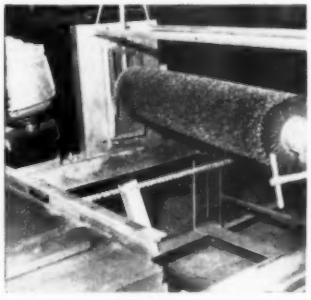
Osborn wire wheel brushes have removed the blemishes and prepared the surface for lacquering.

What takes off the coat and helps the salesmen?

...a brush! Here's a door-way to better aluminum products:

The product is an aluminum door. It was impractical to make lacquer adhere uniformly to the aluminum. With the help of the **O**sborn **B**rushing **A**nalyst, a machine using Osborn wire brushes was built to prepare the surface for lacquering. Result: lacquer sticks perfectly to the brushed surface, giving an attractive, durable finish that helps sales.

The **O**sborn **B**rushing **A**nalyst is opening the door to lower costs and better products of every description. Have him survey your operations, including cleaning and finishing. Call or write *The Osborn Manufacturing Company, Dept. 524, 5401 Hamilton Avenue, Cleveland 14, Ohio.*



THE BRUSHING MACHINE

Door is mounted on a conveying table which travels under Osborn brushes mounted as shown. Brush at left brushes side of door. After traveling one way, door is turned over and table reverses.

YOU TOO

can have a simple brushing machine to help you produce better, more salable products. Let Osborn show you how.

OSBORN

LOOK FOR THE NAME OSBORN . . . RECOGNIZED EVERYWHERE FOR QUALITY WORKMANSHIP AND MATERIALS

Are you turning in all your SCRAP?

Don't wait for "George" to do it

You'll find your local scrap dealers listed in the yellow pages of the phone directory.

IF you are a steel user, this important job of getting more scrap back to the mills is directly up to *you*. You just cannot afford to sit idly by while the scrap shortage gets worse. For unless everyone really pitches into this job of digging out all the scrap possible, steel production is bound to suffer, and every steel user, in more or less degree, will suffer too.

More scrap means *more* steel—it's as simple as that.

Right now some mills have only a bare two-days' supply of scrap on hand. Others have even less. Some steel-making furnaces already have had to shut down for lack of scrap. The situation is serious. Only you can help improve it.

By turning in every piece of worn-out equipment, every obsolete tool and machine, in fact every pound of iron and steel scrap you can comb out of your plant, you'll be helping relieve the worst scrap shortage since Pearl Harbor days . . . and the steel industry will be able to produce more of the steel you need.

Remember—it takes at least one-half ton of scrap to make one ton of steel. To maintain steel's present high production schedules requires more than 1400 carloads of industrial scrap *every* day. So turn in your scrap—ALL your scrap—and keep the mills rolling. This is more than a shortage. It's an emergency that vitally concerns you—and us—and the Nation.

This page would ordinarily be used to tell you about

U·S·S CARILLOY STEELS

but, because without SCRAP we cannot produce steel, we are asking instead for your all-out help in getting more SCRAP to the mills.

UNITED STATES STEEL COMPANY, PITTSBURGH · COLUMBIA STEEL COMPANY, SAN FRANCISCO
TENNESSEE COAL, IRON & RAILROAD COMPANY, BIRMINGHAM
UNITED STATES STEEL SUPPLY COMPANY, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

1-1348

UNITED STATES STEEL

New Thompson AUTOMATIC double wheel TRUFORM Grinder speeds jet engine production

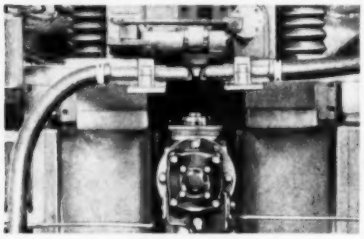
GRINDS BOTH SIDES OF JET TURBINE BUCKETS OR BLADES SIMULTANEOUSLY IN A SINGLE SETTING

To grind root sections on gas turbine buckets with greatest accuracy and productivity, Thompson developed this new AUTOMATIC double wheel TRUFORMING machine featuring simultaneous grinding of both sides of root section with one setting of work.

Grinds rough to finish in 110 seconds . . . or 30 buckets per hour

Hood doors, work clamps, coolant flow, grinding and crushing cycles are actuated in automatic sequence on the new Thompson AUTOMATIC double wheel TRUFORM Grinder.

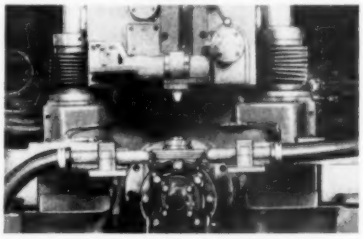
On a bucket having 2" length of form similar in design to the one in the diagram above with .150" stock removal per side from rough to finish size, production is 30 buckets per hour at a steady day after day rate. This includes down time for dressing, regrinding the crusher roll, initial machine warm up period, wheel changing and diamond changing. Actual machine time from rough forging or casting to finish is 104 seconds plus 6 seconds for loading and unloading time . . . makes total time floor to floor 110 seconds per piece.



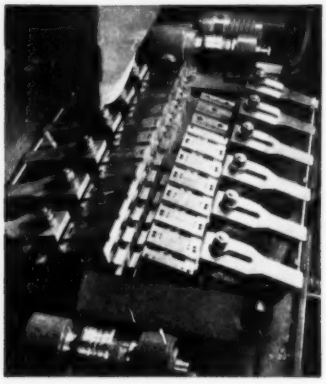
FOR ABSOLUTE SYMMETRY BOTH WHEELS ARE DRESSED FROM A SINGLE CRUSHER ROLL

GRINDING POSITION

CRUSHING POSITION



Standard THOMPSON TRUFORM Machines also grind jet buckets faster, better

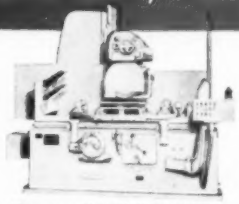


By means of multiple grinding of jet turbine buckets the standard TRUFORM Grinders still offer high production plus many advantages such as flexibility of standard machine design and lower first cost. Although compared to the new AUTOMATIC the standard TRUFORM requires more skillful set up and tooling.

Typical tooling on Type "C" TRUFORM producing 24 buckets per hour. Type "B" TRUFORM produces 18 parts per hour.

FOR COMPLETE DETAILS WRITE TODAY

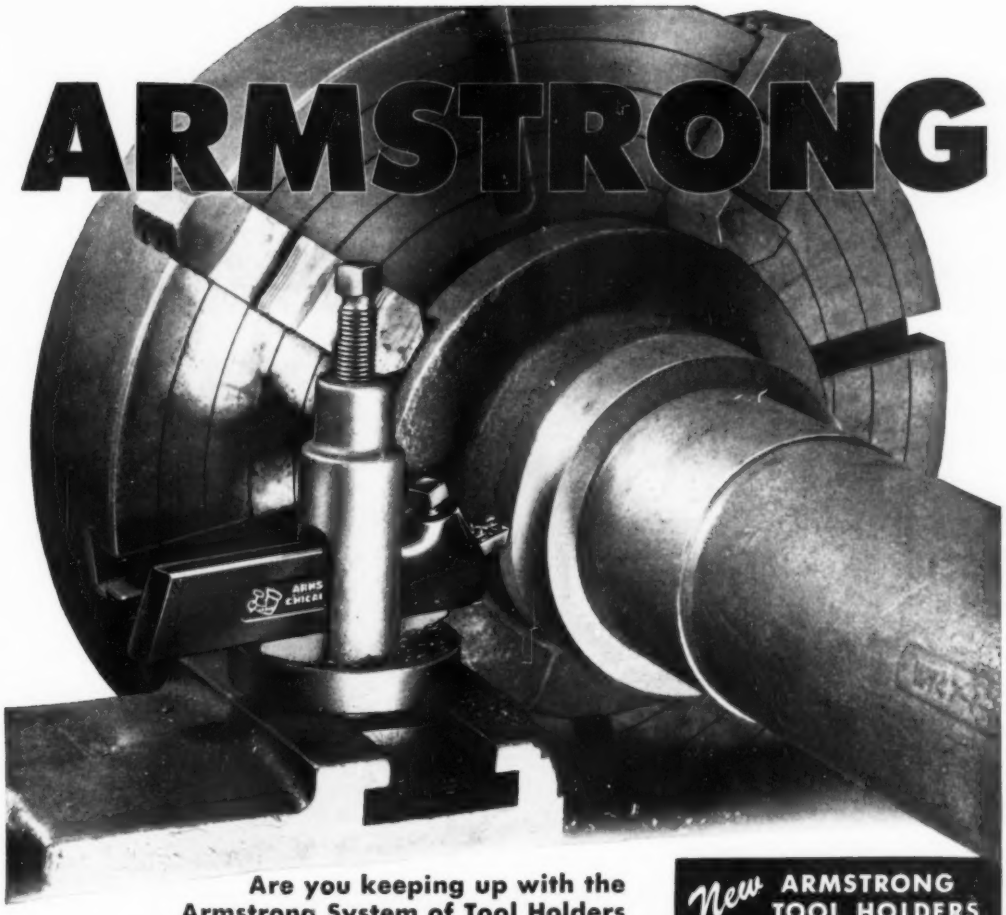
The Thompson Grinder Co.
Springfield, Ohio



Thompson Type "C" TRUFORM

Thompson SURFACE Grinders

ARMSTRONG



Are you keeping up with the Armstrong System of Tool Holders

Doubtless you are daily using ARMSTRONG TOOL HOLDERS that have been in continuous operation for many years. This is sound practice, for this means added profits without added tool costs. But to become complacent, so satisfied that you forget your ARMSTRONG TOOL HOLDERS, is unwise. The "Armstrong System" is a growing thing, with new types and sizes of ARMSTRONG TOOL HOLDERS constantly being developed to more effectively meet new machining conditions, or to take advantage of newly developed cutting materials.

With modern ARMSTRONG TOOL HOLDERS for each operation, you can greatly increase speeds and feeds. You can lower machining cost and further increase profits.

If you haven't kept up with the "Armstrong System" write for an ARMSTRONG Catalog and check to see that you are using the most efficient ARMSTRONG TOOL HOLDER for each operation on all lathes, planers, slotters and shapers.

WRITE FOR CATALOG

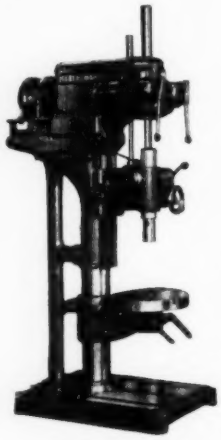
New ARMSTRONG TOOL HOLDERS
ARMSTRONG Spring Form Threading Tool Holder
ARMSTRONG Spring Cutting-off Tools
ARMSTRONG Carbide Tool Holders for Carbide-Tipped Cutters
ARMSTRONG "C-A" Tool Holders for ARMALOY (Cast-Alloy) Cutter-Bits

ARMSTRONG BROS. TOOL CO.

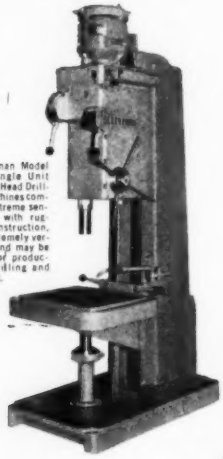
"The Tool Holder People"
5215 W. ARMSTRONG AVENUE CHICAGO 30, ILL.

THE CLEEREMAN LINE

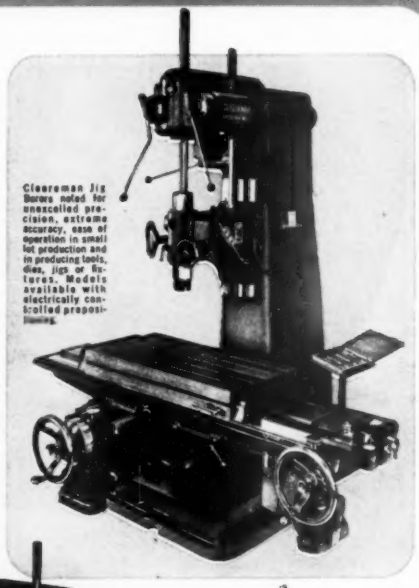
OF PRECISION JIG BORERS and DRILLING MACHINES



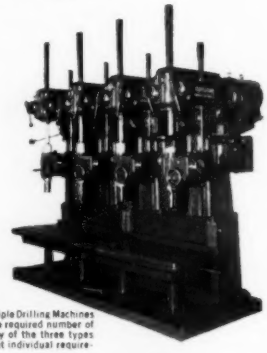
Cleereman Round Column Drilling Machines produce accurate holes at high speed and at low cost and are general purpose machines with high production.



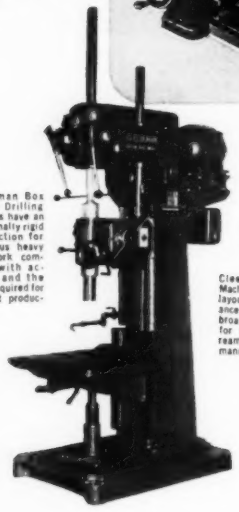
Cleereman Model 325 Single Unit Sliding Head Drilling Machines combine extreme sensitivity with rugged construction, are extremely versatile and may be used for production drilling and tapping.



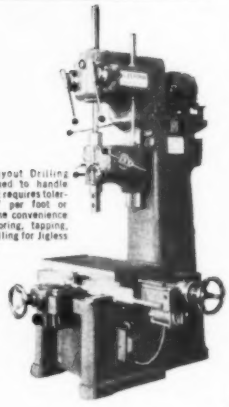
Cleereman Jig Borers noted for unexcelled precision, extreme accuracy, ease of operation in small lot production and in producing tools, dies, jigs or fixtures. Models available with electrically controlled preposi-tioning.



Cleereman Multiple Drilling Machines consisting of the required number of machines of any of the three types supplied to meet individual requirements.



Cleereman Box Column Drilling Machines have an exceptionally rigid construction for continuous heavy duty work combined with accuracy and the speed required for low cost production.



Cleereman Layout Drilling Machine designed to handle layout work that requires tolerances of .001" per foot or broader. Extreme convenience for drilling, boring, tapping, reaming and milling for jigless manufacturing.

BRYANT
Machinery & Engineering Company
General Office
400 West Madison Street, Chicago 6
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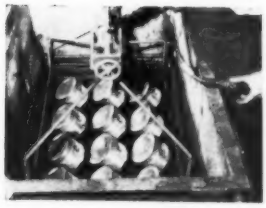
Affiliated with..

CLEEREMAN MACHINE TOOL CO. Green Bay, Wisconsin

IN "PRODUCTION-LINE" CLEANING

Vapor Degreasing CAN SAVE YOU TIME . . . SPEED YOUR OUTPUT

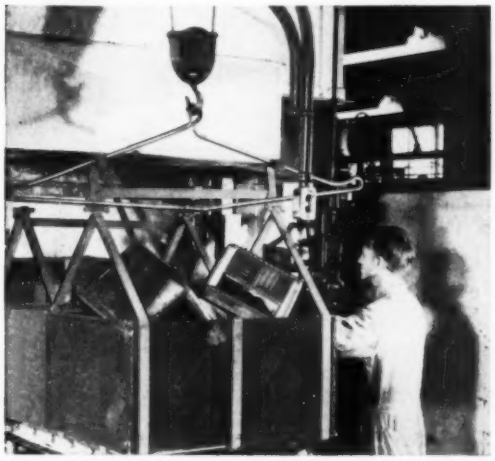


AFTER MACHINING . . .

Cutting oils and buffing compounds are quickly removed from these aluminum aircraft engine pistons. Manually operated degreaser handles precision parts without risk of damage inherent in mechanical cleaning methods.

OR BEFORE PAINTING . . .

Thorough, rapid cleaning of stamped business-machine housings is just one of this conveyorized degreaser's jobs. It handles a wide range of work at various steps in manufacture.



Less than a minute! That's how fast oil and grease are often cleaned from metal when vapor degreasing with Du Pont Trichlorethylene. Vapor degreasing reaches inaccessible places, leaves parts clean and dry, ready for the next step. It saves time often wasted in slower, costly hand and mechanical cleaning.

Vapor degreasing can clean parts of any size, any shape, any metal. And a wide variety of highly efficient equipment is available. Units can be easily installed at any step in your production line. A single unit can often handle an entire plant's degreasing work.

Thousands of manufacturers are now using this fast, safe, efficient method of metal cleaning. It's especially applicable for plants expanding production or doing metal cleaning for the first time. Get the facts today by sending the coupon below.

Du Pont Degreasing Solvents have been widely used for many years and are available under various trade marks, such as "Triclene" D.

These solvents are stable . . . stand up against contaminating and destructive materials . . . are the best yet developed by Du Pont for metal degreasing.

Mail the coupon below for more facts on vapor degreasing.

non-flammable
DU PONT SOLVENTS for VAPOR DEGREASING

SOLD NATIONALLY THROUGH DISTRIBUTORS

DU PONT

REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

E. I. du Pont de Nemours & Co. (Inc.)
Electrochemicals Dept., Wilmington 98, Delaware

Please send me detailed information on Vapor Degreasing: applications, advantages, equipment used, and Du Pont solvents available. We are interested in cleaning _____ products.

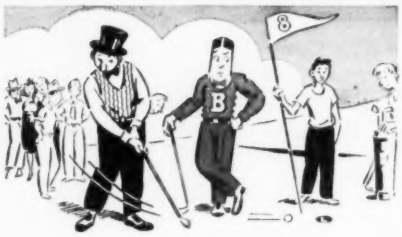
Name _____ *Position* _____

Firm _____

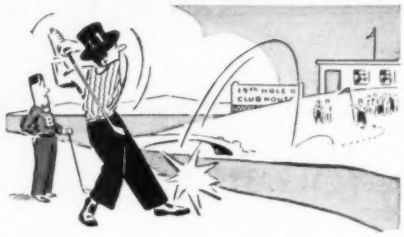
Street and No. _____

City _____ *State* _____

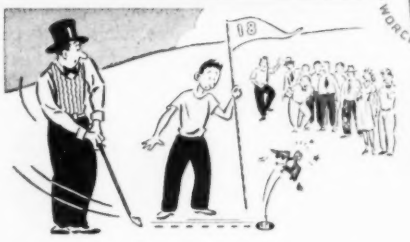
TAPPING TECHNIQUES No. 19



Both Topper and Tapper were "matched" nip and tuck.
The result at each "green" was a matter of luck.

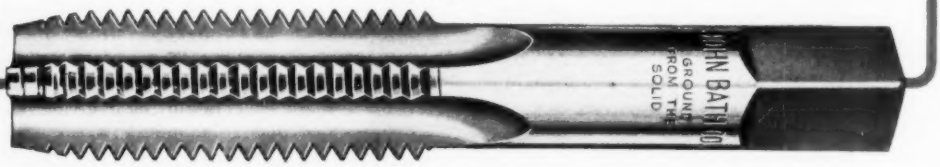


'Til they came to the last and most hazardous hole —
The "strokes" were all even . . . the club house their goal.



One look . . . then Topper, with a club that was sturdy
Sunk a short "putt", to score with a "birdie" . . .

It's locker-room gossip how friend Tapper won —
With Bath Tap Technique . . . for a clean "hole-in-one".



INSIST ON BATH TAPS . . . PROFIT BY THEIR PLUS-PERFORMANCE

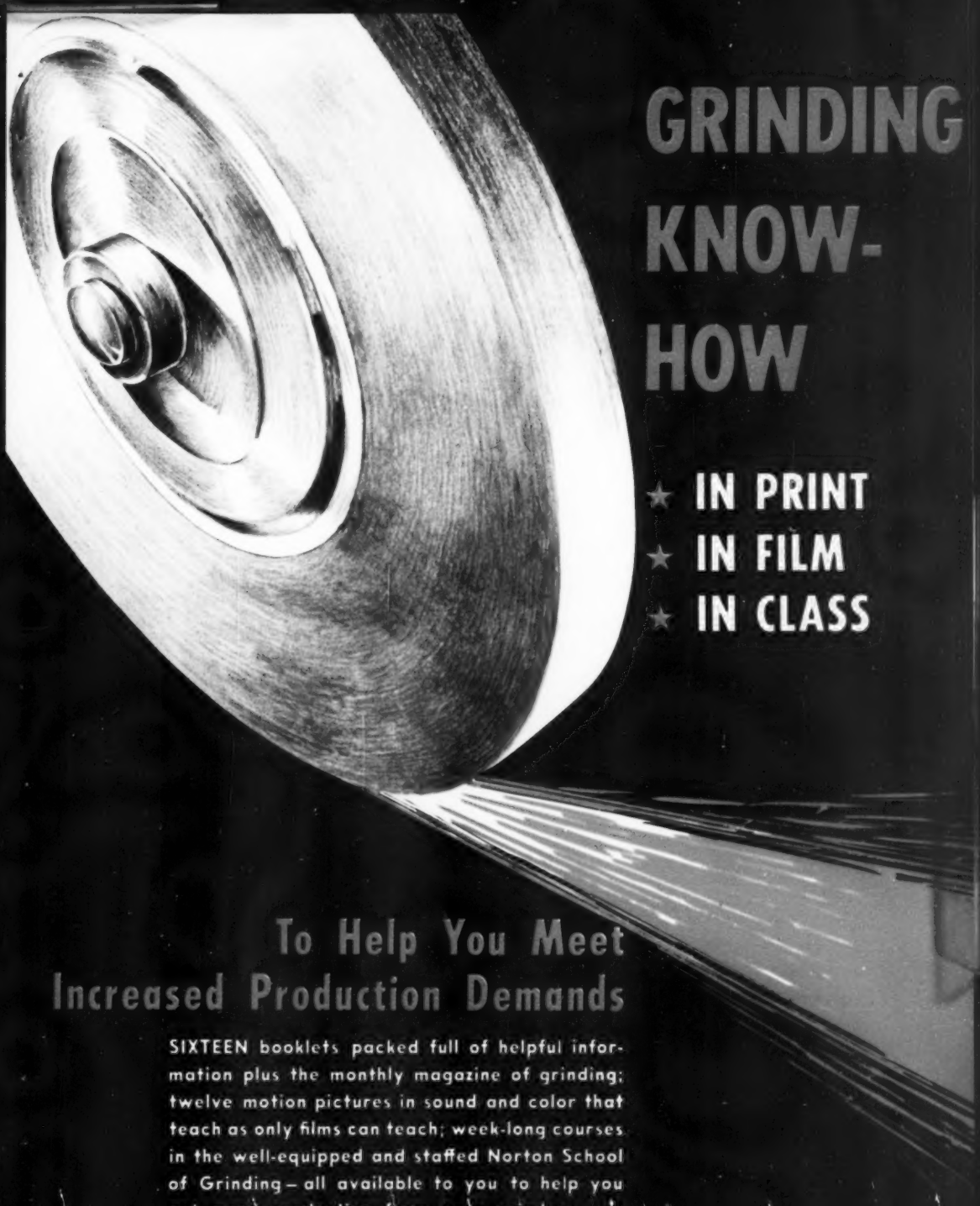
You'll never get into a "sand trap" if you base your use of taps on the number of threaded holes per dollar, for you'll find Bath ground thread taps way over "par" for the number of threaded holes per tap.

There's nothing secret about Bath Tap Technique . . . if you'll select the proper type of tap with relation to (a) the kind of material (b) the thread size (c) the tolerances required . . . taking into consideration the tapping machines and equipment available. With this information, Bath Taps give you the proper "stance" for a good, clean "hole-in-one" every time you "tee off" for mass production. Let us help you with your tapping "hazards" and improve your "score".

PLUG AND RING THREAD GAGES • GROUND THREAD TAPS • INTERNAL MICROMETERS

JOHN BATH CO. INCORPORATED

22 Grafton St., Worcester, Mass.



GRINDING KNOW-HOW

★ IN PRINT
★ IN FILM
★ IN CLASS

To Help You Meet Increased Production Demands

SIXTEEN booklets packed full of helpful information plus the monthly magazine of grinding; twelve motion pictures in sound and color that teach as only films can teach; week-long courses in the well-equipped and staffed Norton School of Grinding – all available to you to help you get more production from your grinders.

Making better products to make other products better

NORTON
ABRASIVES

GRINDING KNOW-HOW . . in print . . in film . . in class

"LESSONS IN GRINDING"

. . . A Series of Motion Pictures with Sound and Color

"Lessons in Grinding" is the title of a series of eight Norton Motion Picture Films which are available to industrial apprentice schools, vocational schools, and all other classes where machine shop practice is being taught. These films present the fundamentals of grinding in a way that the inexperienced man can understand.

"CUTTER SHARPENING"—It teaches the principles of tool room grinding and illustrates typical set-ups.

"THE CYLINDRICAL GRINDER"—The fundamentals of operating a cylindrical grinder are shown and the importance of precision.

"THE SURFACE GRINDER"—The preparation, operation and care of a surface grinder are described. No minor detail is omitted.

"THE GRINDING WHEEL, ITS CARE AND USE"—Subjects such as mounting, balancing, truing, dressing and safety are handled pictorially.

"GRINDING CARBIDE TOOLS"—A new and revised film showing the correct methods of grinding carbide tipped tools.

"THE DIAMOND WHEEL, ITS CARE AND USE"—A new film on the proper handling and care of diamond wheels.

"GRINDING WHEEL MARKINGS"—It clarifies a typical grinding wheel marking, explaining the meaning of each symbol.

"GRINDING WHEEL SAFETY"—It shows the most critical factors in the handling of grinding wheels and the more common causes of wheel breakage.

All Norton films are loaned without charge, all are 16 mm. sound on film.

SCHOOL OF GRINDING

. . . Practical Instruction for Grinding Foremen and Supervisors

A one-week course of visual and oral instruction at the Norton plant is available for grinding department and tool room foremen and assistants, apprentice instructors, and the like. Conducted in the new, well-equipped Norton School of Grinding, this course gives intelligent instruction in the selection and operation of grinding wheels and other abrasive products.

Instruction by a skilled, full-time staff is supplemented with round-table discussions by research laboratory specialists and grinding engineers.

For arrangements and particulars write to Norton Company, Educational Department, Worcester 6, Mass.

GRITS and GRINDS

For forty years this Norton technical magazine has been the recognized authority on grinding. Twelve times a year it brings you articles by Norton engineering experts on how to do your grinding, lapping and polishing jobs better and more economically.

NORTON
ABRASIVES

INFORMATIVE BOOKLETS

. . . Pages and Pages of Production-Boosting Information

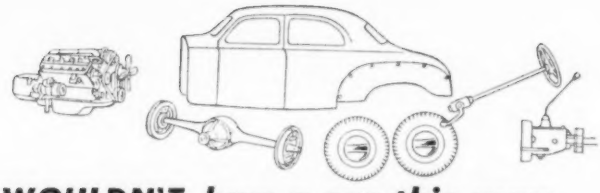
A glance at the titles of these sixteen books will indicate the wealth of grinding know-how that is packed between their covers—information on all phases of grinding, both tool room and production.

In every plant which has the problem of training new grinding machine operators these books will be invaluable. The apprentice will find them a gold mine of information and even the experienced operator will pick up many helpful hints for increasing production and lowering grinding costs.

Sent free on request—no obligation.

NORTON COMPANY, WORCESTER 6, MASS. · Warehouses in Five Cities · Distributors in All Principal Cities

*DAY-GLO FAT'D. © The Bark Engraving Company



YOU WOULDN'T buy a car this way

...so why buy hydraulics piecemeal?

VICKERS Custom Built

HYDRAULIC POWER UNITS

Simplify Hydraulic Design

Reduce Installation and Maintenance Costs

When you buy an automobile you don't make separate purchases of engine, fenders, wheels, frame, axles, gear box, windshield, etc. and try to put them together. You buy a complete car, all in one piece. You don't want the expense and trouble of making the assembly. You *do* want the undivided responsibility of manufacturer and dealer for the complete car.

Why, then, buy hydraulics piecemeal when you can get a Vickers Custom Built Hydraulic Power Unit? It is built to meet your individual requirements. All necessary pumps, valves, intermediate piping, oil reservoir, motors, controls, etc. are in one self-contained "package." It includes all needed hydraulic accessories such as oil filters, air cleaners, oil level gauges, fittings, etc. Hydraulic connections are grouped in a conveniently located manifold.

The result is simplification of hydraulic design and substantial savings in installation and maintenance costs. Undivided responsibility of Vickers for the entire hydraulic system is an important advantage to both the machine builder and his customer. • *Write for Bulletin 50-61.*

VICKERS Incorporated

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Application Engineering Offices:

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ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

4315

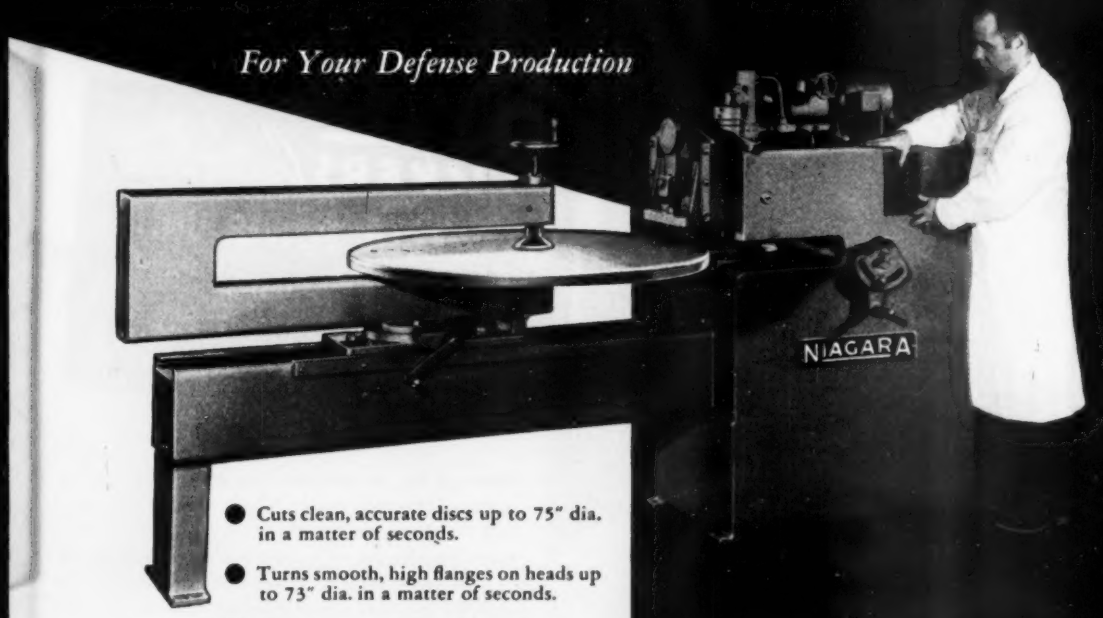
NIAGARA

ANNOUNCES A NEW

Model 8-8 Hi-Production

CIRCLE SHEAR AND FLANGER

For Your Defense Production



- Cuts clean, accurate discs up to 75" dia. in a matter of seconds.
- Turns smooth, high flanges on heads up to 73" dia. in a matter of seconds.
- Capacity up to 8 ga. mild steel, 12 ga. stainless steel.
- Minimum investment in machine and tools for hi-production of a vast size range of discs and heads.
- Fast set up for either circle shearing or flanging operation.

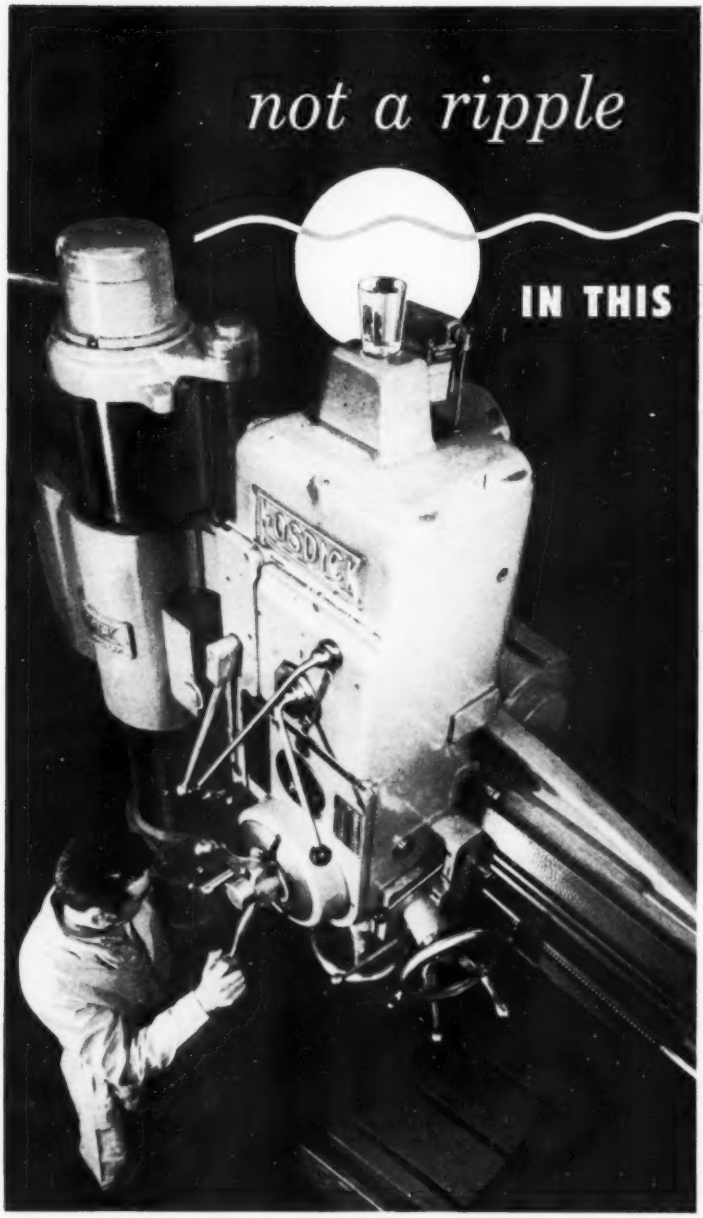
- Ideally adapted for either high or low and even single quantity production.
- Effortless push button control with new automatic feeding cycle.
- Variable Speed Power Flanging Feed lowers and raises upper flanging roll at optimum speed for ideal flanging. Operator can dial to proper feed rate to suit thickness of material.
- Unbreakable steel construction throughout.

Write for Bulletin 86

NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, NEW YORK

Manufacturers of America's Most Complete Line of Presses, Shears, Machines and Tools for Plate and Sheet Metal Work

DISTRICT OFFICES: DETROIT • CLEVELAND • NEW YORK



This Fosdick Hydraulic Radial drills so smoothly you can balance a brim-full glass of water on its head without spilling a drop. It takes rare engineering skill and master craftsmanship to turn the trick . . . to produce a machine that will drill continuously and accurately with a minimum of down-time and operator fatigue.

Performance like this is the result of leadership in the design of drilling equipment. *Fosdick was first* to use hydraulics in Radial Drill controls—hydraulics to clamp the arm and column—hydraulics to provide foolproof safety interlocks—to give you the *finest* Radial money can buy.

Get the whole story on the Fosdick Economax Hydraulic Radial Drill. Call your distributor today, or write for Bulletin RDA.

RADIAL DRILLS
SENSITIVE AND UPRIGHT DRILLS
JIG BORERS

THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

AUTOMATIC POSITIONING MACHINES
SENSITIVE RADIAL DRILLS

FOSDICK

NOW... GISHOLT VERTICAL BALANCING MACHINES

STILL FASTER PRODUCTION BALANCING FOR PARTS UP TO 50 LBS.!

Gisholt leadership in balancing is demonstrated again.

Designed for high volume balancing, these new models locate and measure unbalance with a speed and accuracy unequaled by any other means. Unbalance vibrations as small as .000025" are clearly indicated.

Here's everything for sustained high speed production: compact design . . . meter and angle dial at eye level . . . spindle close to operator for speedy handling of parts . . . all controls efficiently grouped for short reach, less movement, minimum operator fatigue. Machine may be furnished with raised bed for operator to work in standing position.

Using the same proved principle as other Gisholt Balancing Machines, Gisholt Vertical Balancers are available for both static and dynamic balancing of parts up to 50 lbs. Correction equipment can be added where desired. Write for full information.

The Model 1SV1 Vertical Balancing Machine illustrated is one of four basic models of this new type.

DYNETRIC BALANCERS — GISHOLT — DEVELOPED JOINTLY WITH WESTINGHOUSE ELECTRIC CORPORATION. "DYNETRIC" IS A TRADE MARK REG. U. S. PAT. OFFICE BY WESTINGHOUSE ELECTRIC CORPORATION

✻ **GISHOLT BALANCING SCHOOL.** *Complete courses are now offered, covering the theory and practical applications of balancing to help you with your problems. Ask for details.*

THE GISHOLT ROUND TABLE
represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

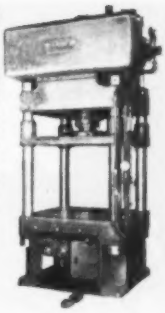
HYDRAULIC PRESSES?

does HANNIFIN build presses, too?

Many think of Hannifin as a builder of the finest hydraulic cylinders on the market. Others rely on Hannifin when air cylinders and air control valves are needed.

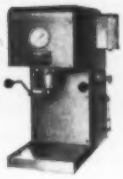
Although both are right . . . Hannifin also builds a long line of widely popular hydraulic presses—more than 75 standard models, 1 to 150 tons—that harness hydraulic power in many ways for job-easing, cost-reducing production. The exclusive features of Hannifin Presses have established them firmly throughout the metalworking industry.

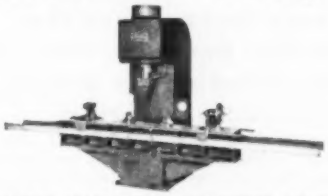
150-TON FOUR-COLUMN PRESS—a standard Hannifin design with semi-automatic cycle. Advance at high speed, feed stroke starting at pre-set point in stroke and automatic reversal. A complete, self-contained unit with reservoir, hydraulic pumps and controls on top of press. Dual electric push button control.



15-TON FORCING PRESS—with built-in hydraulic power unit and exclusive, patented Sensitive Pressure Control. Gap, 22"; stroke, 21"; reach, 10"; table, 19" x 22" with U slot.

HANNIFIN'S NEW HYDRAULIC "HAN-D-PRESS"—a rugged, fast-acting unit for high production on small part assembly operations. Available in 1-ton and 2-ton sizes with pressure adjustable. Stroke,6"; reach, 6"; gap, 10". Speeds: (1 ton) 400 ipm, advance; 800 ipm, return. Dual hand controls standard.





35-TON OPEN GAP STRAIGHTENING PRESS—Model S-351, one of 17 standard straightening presses. Widely used for straightening crankshafts, axle shafts, line shafts and cylinder stock. This model equipped with exclusive Sensitive Pressure Control and spring-mounted, work-holding fixture on 160" rails.

do ALL you CAN do . . . with

HANNIFIN

SUGGESTION: As a start in deciding what Hannifin can do for you, send for specific information on hydraulic presses. The coupon is for your convenience. Hannifin Corporation, 1117 S. Kilbourn Ave., Chicago 24, Illinois.

HANNIFIN CORPORATION
1117 S. Kilbourn Ave., Chicago 24, Illinois
Please send me BULLETIN 130 on Hannifin Hydraulic Presses.

Name.....
Title.....
Company.....
Address.....
City.....*State*.....

FACTS about Sundstrand Automatic Lathes that mean increased production on jobs like these . . . . . .

1. Small Lot Turning...

This Model 8A Automatic Lathe machines a number of different sizes of bronze worm wheels and steel hubs. Two operations are performed on each part. These include turning, facing, and boring. Floor to floor time of the largest worm wheel is 55 seconds.

Some facts about the Design Features that make this production possible ...

The illustrations above show 3 of the 8000 or more installations of Sundstrand Automatic Lathes. These are new lathes and embody all of the latest design features. Many users have changed from old to new Sundstrand Automatic Lathes in order to get the maximum production resulting from design improvements.

The following features, incorporated in the design of the latest models of Sundstrand Automatic Lathes will also help you increase your turning production:

• Greater Horsepower

All new Sundstrand Automatic Lathes have been redesigned for greater rigidity and larger spindle drive motors. They have ample power for use of carbide cutting tools and are capable of doing more work.

• Wider Speed Range

Spindle speed range ratios have been increased to 30 to 1 to obtain maximum in cutting efficiency over a wider range of sizes of parts and material. The spindle unit is equipped with two driving gear centers, which increase the range between high and low spindle speeds. In addition, four speed changes can be obtained from one set of gears instead of the usual two.

• Wider Feed Range

A wider feed range has been provided to enable the handling of a greater range of parts and materials at maximum cutting efficiency. The New Models 4A, 8A, and 12A have a ratio of 18 to 1 between high and low feeds — Model 16 has an even greater range.

• Greater Carriage Adjustment

Both front and rear carriage of the latest Sundstrand Automatic Lathes are adjustable full length between headstock and tailstock centers — another important new feature.

• Faster Set-Up

Convenient location of pick-off gears for changing spindle speeds and front and rear carriage feeds is provided. Feed and speed chart and pick-off gear storage compartment are readily accessible for quick set-up or changeover.

• Quick Cycle Changeover

Complete control of all cycles is provided by adjustment of dogs on a disk. Making cams is eliminated. Changing position of dogs on disk changes length of rapid approach, feed and rapid return strokes — enables operator to set up cycle quickly and change over from one job to another easily.

• Automatic De-Clutching

All new models have been provided with automatic declutching between spindle and spindle motor with self-adjusting magnetic clutch and brake for quick stopping of spindle rotation.

• Screw Feed to Front Carriage

All new Sundstrand Automatic Lathes have screw instead of rack feed to the front carriage — resulting in fine finish and long tool life.

SUNDSTRAND

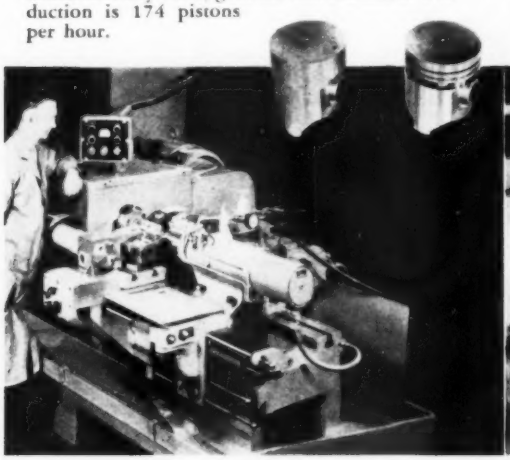
RIGIDMILS • FLUID-SCREW RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT

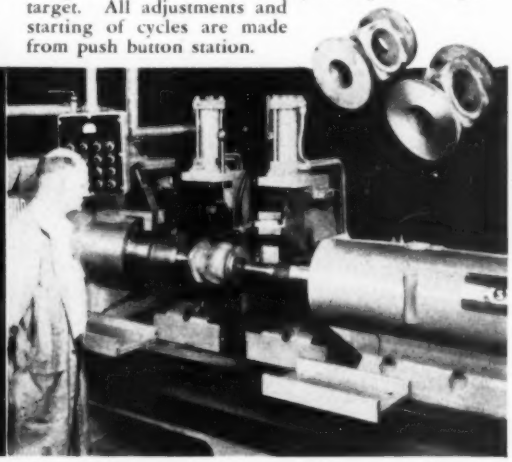
2. Long Run Turning

This Model 8A elliptically turns the O.D., faces the head, roughs, finishes and chamfers the grooves of automotive pistons. Front carriage is oscillated by a cam with power take-off from spindle for turning O.D. The cross-feeding rear slide simultaneously faces, grooves and chamfers. Production is 174 pistons per hour.

3. Special Turning

Both ends of valve bodies are machined simultaneously on this special Model 16 Lathe. Automatic cycle includes facing flanges, indexing of tools for "phonograph finishing" in a 2nd cut and return. Each carriage mounts a slide on which two tool blocks are vertically indexed in two positions. The work is held between centers on an arbor, and tools are positioned to the work by air operated sight target. All adjustments and starting of cycles are made from push button station.





4 Models Cover HP Range of 3 to 75 HP

	MODEL 4A	MODEL 8A	MODEL 12A	MODEL 16
SPINDLE MOTOR	3 to 10 HP	10 to 25 HP	20 to 50 HP	50 to 75 HP
SPEED RANGE (Type A) (Type B)	60 to 1800 RPM 120 to 3600 RPM	40 to 1200 RPM 80 to 2400 RPM	30 to 900 RPM 60 to 1800 RPM	15 to 750 RPM
FEED RANGE	.003 to .048 IPR.	.004 to .070 IPR	.004 to .070 IPR	.0025 to .100 IPR
FRONT CARRIAGE: Longitudinal feed with angular feed-in, max. Swing over cross slide, max. Rapid traverse rate	 5" 8¾" 275"	 6" 12½" 250"	 8" 15¼" 250"	 12" 17" 250"
REAR SLIDE: Max. Stroke	4"	5½"	6½"	8"
LENGTH BETWEEN CENTERS	15, 24 & 36"	24, 36, 48 & 60".	24, 36, 48 & 60"	36, 60 & 84"

GET ALL THE FACTS NOW!

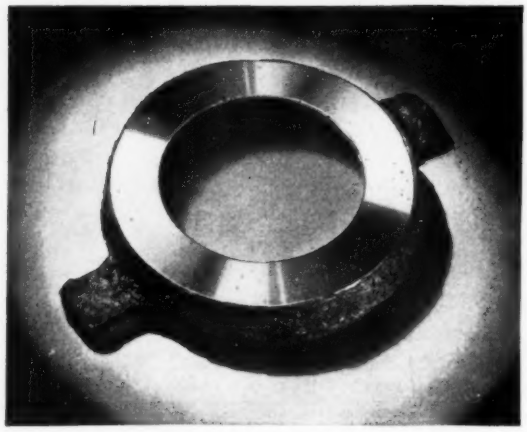
If you have turning operations, be sure to have this up-to-date material at hand. The complete line of Sundstrand Automatic Lathes includes the Models 4A, 8A, 12A and 16 — ranging from 3 to 75 H.P. Ask for bulletin 111.

SUNDSTRAND

SUNDSTRAND
Machine Tool Company
2533 Eleventh St. Rockford, Ill., U.S.A.

DRILLING AND CENTERING MACHINES • SPECIAL MILLING AND TURNING MACHINES

NOT WANTED



X-RAY

Good only for scrap. That's the fate of an imperfect casting. No one wants it, but *someone has to pay* once expensive machining has been started.

That's why leaders in industry are placing confidence in radiography. A vital inspection tool for detecting internal discontinuities prior to finishing operations. Before the ledger grows red with costly machining.

As an inspection device, industrial x-ray is often a non-destructive substitute for physical test and sectioning. But its applications are far broader. In fact, industrial x-ray has become a *development* tool. An instrument that not only diagnoses, but suggests treatment as well. It shows where savings can be made, designs improved.

Write for booklet "Industrial Application of the X-Ray". X-Ray Department, General Electric Company, Room AB-9, Milwaukee 14, Wisconsin.

GENERAL ELECTRIC

Hammer Forged

Steel makers appreciate the importance of hammer-forging in the refinement of steel and that's why it's universally used from ingot to billet in the making of the higher grades of tool steel.

Hammer-forged GTD-AMPCO drills carry process further to the highest possible refinement ob- high-speed steel. And, as a fitting climax to HAMMER- TD-AMPCO drills are polished in the flutes, insuring free chip which is so essential in drilling deep holes, cast iron and non- metals. For the best, insist on GTD-AMPCO hammer-forged drills.

AMPCO TWIST DRILL DIVISION

GREENFIELD TAP AND DIE CORPORATION

Greenfield, Massachusetts

The Complete Tap Story

Yes, here at a glance is all you will normally need to know about taps: The types available, how to select the right one for your job, how to order it, and how to use it.

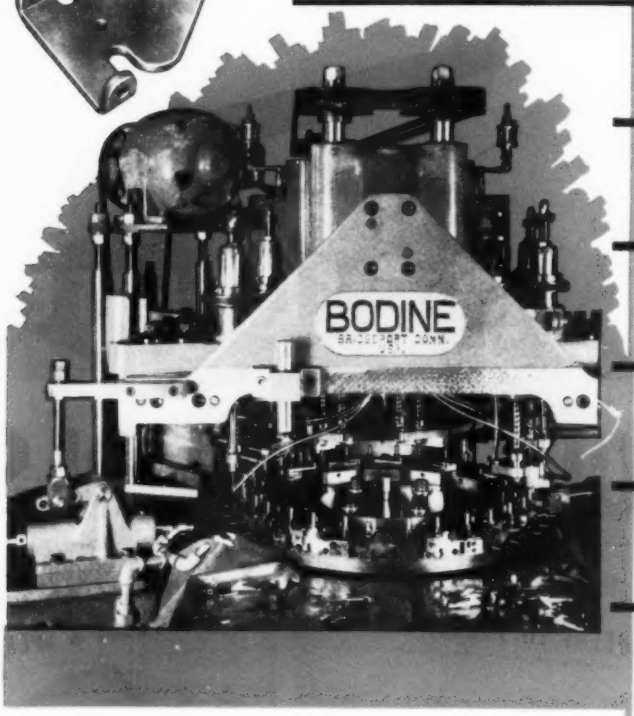
And, as though that were not enough, backing the complete story is your "Greenfield Man," a member of the largest staff of field service engineers devoted to threading problems exclusively.

GREENFIELD TAP AND DIE CORPORATION
Greenfield, Massachusetts

BUY GTD GREENFIELD!

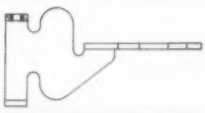
Bodine CASE HISTORY NO. 30

PROCESSING A MAGNETIC IRON VERTICAL ARMATURE

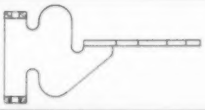


1. Hand load blank to spring clamping type fixture.

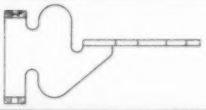
2. ⅛ drill — top ear, vertical spindle.



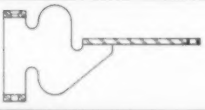
3. ⅛ drill—bottom vertical spindle



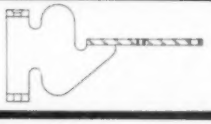
4. C'sink top ear, vertical spindle.



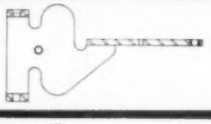
5. No. 22 (.152) drill, vert. spindle.



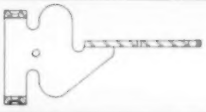
6. No. 55 (.052) drill, vert. spindle.



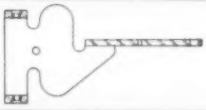
7. .1565 ± .0005—vert. spin.; No. 38 (.1015) drill, hor. spin.



8. C'sink bottom ear, inverted spindle.



9. No. 30 (.1285) ream —thru both ears within .002 alignment, vert. spin.



10. Automatically eject.

PRODUCTION:

Tooling includes 7 vertical, 1 horizontal and 1 inverted spindle to produce 750 completed pieces per 50 minute hour at machine speed of 15 strokes per minute. For use by prime and subcontractors of small components, Bodine engineers will design tooling for high repetitive production at lowest costs. Write for details.

"You Can't Meet Tomorrow's Competition With Yesterday's Machine Tools"

THE **Bodine** CORPORATION
BRIDGEPORT 3, CONNECTICUT

AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES

39D81

INCREASE CARBIDE TOOL PRODUCTIVITY

300% to 400%

with

FIRTHITE

MECHANICLAMPT TOOLS

- NO BRAZING OF TIPS
- NO "SPECIAL" GRINDING
- USE *STANDARD* TIPS—USE HARDER GRADES
- SPEEDY TIP ADJUSTMENT—USE MAXIMUM FEEDS & SPEEDS

For Automatic Machining... ask about the NEWLY Improved

MECHANIGRIPT TOOLS

Completely redesigned, shop tested and proved. 8 points of superiority that makes the NEW Mechanigript Tools the most outstanding vertical insert tools.

Shop tested . . . perfected . . . and proved! Using STANDARD Stock Style 0000 carbide tips, the new Mechaniclampt design multiplies carbide tool productivity 3 to 4 times over brazed tools of the same tip size.

For Duplicator Contour Turning, Planing, Shell Turning, Boring; Engine Lathes, Turret Lathes, and General Machine Shop Use.

SIX TOOL STYLES (right and left)

STYLE BRC (right) STYLE FRC (right) STYLE GRC (right)

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General Offices: 3113 Forbes St., Pittsburgh 30, Pa.

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FLUID DRIVE
reduces clutch wear

HYPOID GEARING
30% greater strength

CHRYSLER ENGINE
65HP industrial engine with floating power

AUTOMOTIVE TYPE SAFETY BRAKES
smooth brake action

SHOCKLESS STEERING
passenger car steering ease

ROLLER CARRIER UPRIGHTS
low friction—long life

Only YALE combines all these modern engineering achievements in one superior gas truck!

NOW READY FOR YOU... developed to peak efficiency after 2 years of intensive on-the-job testing

JUST LOOK at the engineering and technical improvements built into this new YALE Fork Lift Gas Truck!

Here are exclusive features that will bring more time-saving, man-saving, money-saving advantages to your materials handling than was ever before possible!

In every vital part of this truck you get the finest new developments in automotive engineering—every part built for years of hard service—every part tested and re-tested under rugged on-the-job conditions.

That's why today you get smooth, powerful gas truck operation day-in day-out. On steep ramps, rough roadways, in any weather—this YALE Gas Truck *delivers*, moves, lifts and stacks the goods. Let us show you exactly *how* YALE can accomplish all of this in your plant. Write for the facts today.

Capacities up to 10,000 pounds

WRITE TODAY FOR FULL INFORMATION

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Roosevelt Boulevard & Haldeman Avenue, Phila. 15, Pa.

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_____Please have your local representative call on me.
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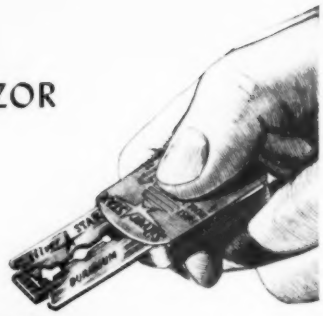
YALE

MATERIALS HANDLING EQUIPMENT
Philadelphia 15, Pa.

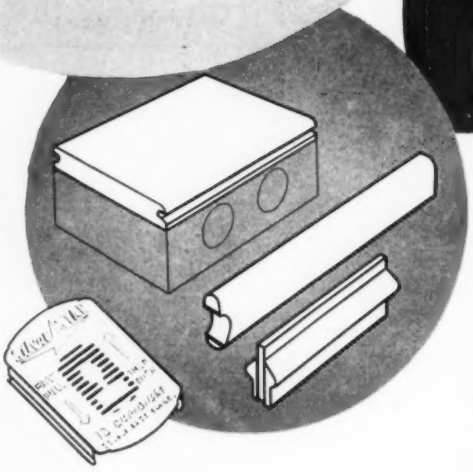
AMERICAN SAFETY RAZOR



INCREASED PRODUCTION

15 TIMES

BY SWITCHING TO ADAMAS CARBIDE



Operation—Blanking Cover for "Silver Star" blade dispenser

Material—Type 430 stainless steel .016 inches thick

Oil Hardened Tool Steel die inserts had to be removed after 100,000 covers for regrinding.

ASR switched to Adamas Carbide die inserts. Now 1,500,000 covers are blanked before regrinding is necessary.

Additional advantages are: 1) Burr-free parts, 2) Uniformity of size throughout run, 3) Lower unit cost, 4) Less scrap loss.

Here's *proof* of ADAMAS CARBIDE on-the-job superiority.

Today, with the accent on production, you need tungsten carbide tools and dies you can depend on—that have greater wear resistance—stay on the job longer. ADAMAS CARBIDE work-proved grades are job-engineered to your particular needs. This means lower tool and die maintenance, lower labor costs, decreased down-time, and increased productivity.

Write for your FREE copy of the ADAMAS "Braze and Save" booklet illustrating best procedures for brazing carbide tool tips.
Dept. A

ADAMAS CARBIDE CORPORATION
HARRISON, N. J.

Producers of job-engineered tungsten carbide for cutting tools, dies and wear resistance.

Triple-Threat Star

ON ANY TEAM

CIMCOOL® is the outstanding coolant that more plants are including in their line-up every day. For this revolutionary cutting fluid—this *chemical emulsion* that covers 85% of all metal cutting jobs—is a triple-threat to high costs in three important ways. Here's how Cimcool can save you money:

- CIMCOOL INCREASES TOOL LIFE (and thus reduces down time) because of its chemical lubricity.
- FASTER SPEEDS are possible because CIMCOOL cools faster, through a unique physical change in the cutting fluid itself. Tools and chips actually stay cool to the touch.
- CIMCOOL COSTS LESS than old-fashioned cutting fluids because it lasts longer. It also cuts labor costs for cleaning and changing. It virtually eliminates rancidity and foul odors. And because of its low surface tension and low adhesion to work and chips, there is practically no carry off.

We sincerely believe that one week's run will convince you. And we'll be pleased to provide a demonstration in one of your own machines. Just write us and we'll have one of our Cincinnati Milling-trained machinists call on you. Or, if you prefer, write for our free booklet "CIMCOOL Gives the Answers." Address, Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

®Trade Mark Reg. U.S. Pat. Off.

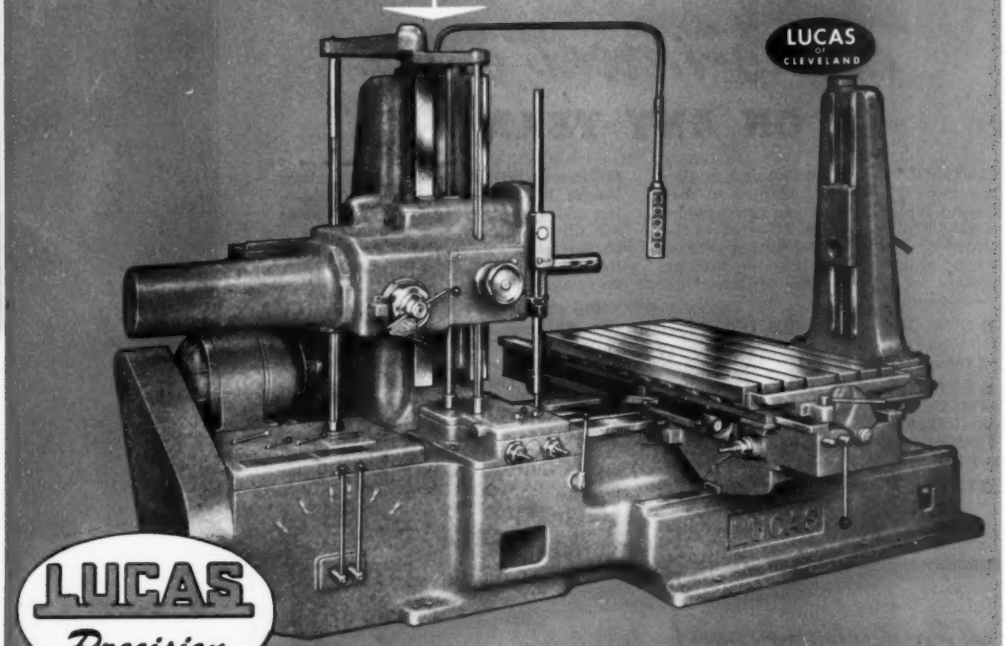
A Production-Proved Product of
THE CINCINNATI MILLING MACHINE CO.

for 85% OF ALL METAL CUTTING JOBS

These *Big improvements* in boring machines have been Lucas Features *for years*

Every advancement of importance to be found in *any* boring mill is obtainable in a Lucas. In many cases Lucas has been years ahead, and some very important developments can be found *only* in Lucas machines. Fifty-one years of specialization on one product has made Lucas the first name in its field.

- Automatic power positioning
- Integrally cast four way beds with 4 point support
- Complete range of feeds and speeds to one spindle
- Pendant control
- Vibrationless V-Belt drive to spindle at high speeds
- Complete line of attachments
- Hardened ways
- Chrome plated lead screws



LUCAS *Precision*

HORIZONTAL BORING, DRILLING AND MILLING MACHINES
LUCAS MACHINE DIVISION, THE NEW BRITAIN MACHINE CO.
CLEVELAND 8, OHIO

"Tool life on Inconel rivets up 35% with Gulf Electro Cutting Oil"

SAYS THIS GENERAL MANAGER

"Because we specialize in tough machining jobs, we know that there's a big difference in cutting oils," says this General Manager. "On Inconel aircraft rivets, for example, we get much better results with Gulf Electro Cutting Oil. Production is up 35%, and tool life is excellent:

Form & cut-off tools—500-600 pieces per grind
Carboloy box tools—800 pieces per grind
Center spotting tool—500-600 pieces per grind

Here's the important reason why Gulf Electro Cutting Oil delivers such outstanding performance. Thanks to a special Gulf process of combining sulphur, it provides greater sulphur activity over the entire range of a cutting operation. This intensified chemical action means better protection for the tool at elevated production rates—helps reduce built-up edge, prevents chip welding, prolongs tool life.

Operators like it because they get these production advantages without the disagreeable odor ordinarily associated with sulphurized cutting oils.

Call in a Gulf Lubrication Engineer today and arrange to use this outstanding oil in your shop, or send the coupon below for additional information.

FIFTY YEARS OF SERVICE
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PETROLEUM AND ITS PRODUCTS

Gulf Oil Corporation · Gulf Refining Company AM
719 Gulf Building, Pittsburgh 30, Pa.
Please send me, without obligation, a copy of your pamphlet "Gulf Electro Cutting Oil."

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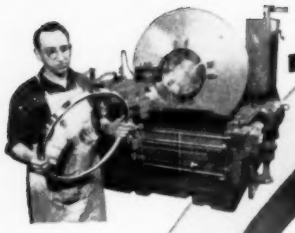


Turning rings around former methods

THE REVOLUTIONARY NEW

LODGE & SHIPLEY 60" *T* RIGHT ANGLE *Chucking Lathe*

...The first really new lathe in over 100 years

Partial view of Lodge & Shipley T Lathe battery at Pratt & Whitney Aircraft. These T lathes are used to machine short, thin-wall, large diameter work pieces for P&W axial-flow jet engines.

The problem of facing, turning and boring thin-wall section work of large diameter and short length has been solved with the radically new Lodge & Shipley *T* Lathe developed from a suggestion of Pratt & Whitney Aircraft. This 60" right angle chucking lathe eliminates slow and costly machining formerly done on raised or gap engine lathes or vertical boring mills.

Proved to be far faster, more accurate and sensitive and much more accessible, the *T* Lathe is twice as compact, costs less than conventional machines. The bed is in the shape of a "T". The carriage operates at right angles to the centerline of the lathe.

Also designed for the application of Lodge & Shipley COPYMATIC automatic tracer control and variable speed drive if required, the *T* Lathe is extremely versatile. For thin-walled, short length, large diameter work, the *T* Lathe will serve you profitably.

Write for detailed information in Bulletin 209.

Only the *T* lathe offers these outstanding advantages

- Costs less than conventional machines
- Saves 50% or more in floor space
- Makes large, cumbersome engine and raised lathes obsolete
- Offers operating efficiency with centrally located apron controls
- Facilitates loading and unloading by unique *T* Lathe design
- Enables operator to follow cutting tools to fine dimensions

THE Lodge & Shipley COMPANY

MACHINE TOOL DIVISION
3059 COLERAIN
CHOREMASTER DIVISION
800 EVANS ST.
CINCINNATI 25, OHIO

Super

THE MOST COMPLETE LINE OF QUALITY CARBIDE TOOLS

STANDARD • SPECIAL

Super

TOOL COMPANY

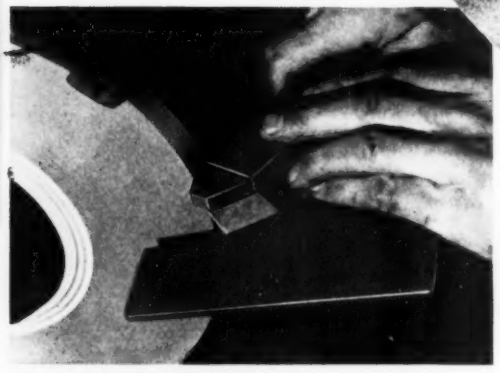
21650 Hoover Rd., Detroit 13, Michigan • 5210 San Fernando Rd., Glendale 3, California

NEW "XL" BOND FOR CARBIDE TOOL AND CUTTER GRINDING

Assures Efficient Performance at Far Lower Cost!

It's really big news . . . this new "XL" Bond! "XL" is the name of Chicago Wheel's remarkable new line of silicon carbide vitrified grinding wheels . . . especially made for carbide tool and cutter grinding.

"XL" wheels come in the most popular tool and cutter sizes and steel backs. They're designed for efficient, economical, rough and finish grinding . . . offhand or precision automatic. And they're already proving themselves on the job, helping to keep the nation's carbide tools and cutters in first-class shape for the mobilization program. "XL" is unexcelled . . . and another 1st for Chicago Wheel!



WRITE NOW!
Send for literature and engineering report on the new "XL" Bond Silicon Carbide Grinding Wheels.

CHICAGO WHEEL & Mfg. Co.
1101 West Monroe Street, Chicago 7, Illinois

OFFICES IN PRINCIPAL INDUSTRIAL CENTERS

CHICAGO WHEEL & MFG. CO. Dept. Am
1101 West Monroe Street, Chicago 7, Illinois

Name .....
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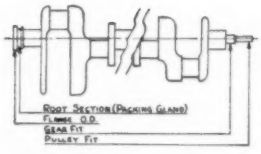
Salvage of rejects speeded by new metallizing alloy

outwears old bearing material 25 times

Automotive manufacturer replaces chrome plating installation with metallizing for salvage of mis-machined crankshafts; steps up output to 10 per hour

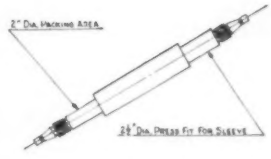
Sprabond Wire, the new self-bonding metallizing alloy, is speeding reject salvage in a wide range of production applications. It has been found particularly valuable in building up parts which have been machined undersize, or damaged by tool marks. Resulting surfaces are extremely hard and, due to their microscopic pore structure, tend to hold considerable amounts of oil. These factors produce excellent wear characteristics, some users reporting increases in service life as much as 25 times that obtained in any other way.

Application is simple and fast; only 3 operations: (1) the part is cleaned or undercut; (2) Sprabond Wire applied; (3) the surface finish-ground. Dovetailing and undercutting often not required and build-up can be carried to a feather edge. No danger of warpage because negligible heat is generated in the part during spraying.



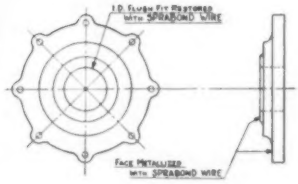
Better and faster than plating

Sketch shows automotive crankshaft of the type being reclaimed in quantity by large manufacturer. These parts were formerly reclaimed by plating, which was slow and expensive. With metallizing, however, production rate is 10 shafts per hour.



Where welding is impractical

Heat warping and consequent straightening costs made welding impractical for salvage of blower shafts such as shown above. Shafts formerly scrapped and replaced are now rebuilt. With Sprabond Wire metallizing, saving is $45.00 each.



Fits restored—no re-machining

Press fit in electric motor end bell is frequently lost through wear. Welding is impractical here, too, because of warpage. But a few thousandths of Sprabond Wire on the I.D. builds a press fit so that even minimum grinding is often unnecessary. Savings per end bell—about $30.00.

Some other money-saving applications for the Sprabond Wire process

Cracked blocks and castings—flat surfaces—molds, patterns, match plates—sand holes thin sections—lathe ways—inside diameters—gas holes.

FREE BULLETIN Metco Bulletin 57B describes the advantages of the Sprabond Wire metallizing process in detail. Micro-photograph of Sprabond Wire coating on steel shows how it works. Use the coupon to send for your free copy today. No obligation, of course.

METALLIZING ENGINEERING CO., INC.
38-24 30TH STREET LONG ISLAND CITY 1, N. Y.
In Great Britain: METALLIZING EQUIPMENT COMPANY, LTD. Chobham near Woking, England

The following trade names are the property of Metallizing Engineering Co., Inc.: METCO*, SPRABOND WIRE. *Reg. U. S. Pat. Off.

R. J. McWaters
Metallizing Engineering Co., Inc.
38-24 30th St., Long Island City 1, New York

Please send me Bulletin 57B.

NAME_____

COMPANY_____

ADDRESS_____

CITY_____ STATE_____

This is another of the "HUNDREDS OF JOBS" which can be done on a MARVEL Band Saw!

MARVEL BAND SAW saved these two 4400 lb. castings

Two sand cores washed out when these giant 4400 pound steel connecting rods were cast, resulting in solid eye ends without gaps. Then came the $64 question—how to machine out the 1½" slots in the longitudinal center of the eyes which were 22" high and had a wall thickness of 6½".

The Ernest J. Nelson Iron Works of San Francisco, did this "impossible" job easily, quickly and economically, without special tooling, on a standard Model 8M/2 MARVEL Band Saw. Two cuts were made in each rod in two hours per cut with tool cost of $3.06 per rod. The tool was a MARVEL B9-10 Band Saw Blade.

Every tool room, machine shop and maintenance department needs a MARVEL Series 8 Universal Band Saw—not only for innumerable everyday jobs but for the occasional "trick" operations, where its utmost versatility will save many headaches and dollars.

WRITE FOR CATALOG

Armstrong Metal Cutting MARVEL SAWS
Better Machines—Better Blades

These exclusive MARVEL Features made this job easy.

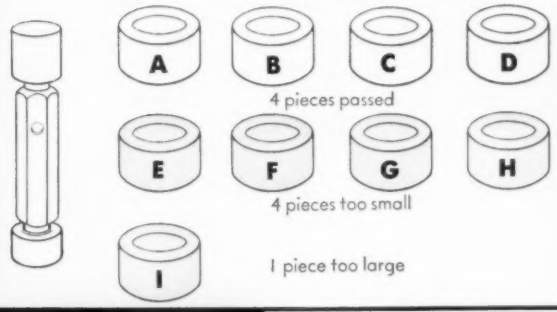
1. Large, T-slotted work table.
2. Blade feeds into work vertically; work always stationary.
3. Power-pressure feed.
4. Automatic Blade tension.
5. Built-in coolant system.
6. Large capacity.

ARMSTRONG-BLUM MFG. CO.

5700 BLOOMINGDALE AVENUE **CHICAGO 39, ILLINOIS**

An ABC Demonstration of DuBo* Plug Gage Superiority

Inspection of 9 pieces using conventional plug gage
Bore Diam. 1.500"; Total Tolerance .001"



RESULTS of same inspection using DuBo Plug Gage

Of the 4 pieces passed by conventional plug gage above, only 3 are actually within specified limits when inspected with the more sensitive DuBo plug gage.

DuBo reveals piece D (passed above) is too large.

Of the 4 rejected as too small by conventional plug gage, E and F are actually within the limit when inspected with DuBo plug gage.

I, rejected by conventional gage as too large, is so verified when inspected with DuBo plug gage.

Of nine pieces inspected, DuBo reclaimed two false rejects and rejected one piece that had been passed by ordinary plug gage inspection. Apply even a fraction of this ratio to a day's production in your own plant and you'll realize the advantage of using DuBo plug gages.

*U.S. and Foreign Patents Granted

At left:
SINGLE END
DuBo Plug.Sizes
1.510" to 6.010"

At right:
DOUBLE END
DuBo Plug.Sizes
.240" to 1.510"

DuBo Plugs Wear 5 to 10 Times Longer than Conventional Plugs

The spherical gaging surface of the DuBo plug gage, specially relieved, has the advantage of easy entry, with contact only at the point of gaging. Lightness in weight, sensitivity and finger-tip control also mean speed and less wear.

Don't Let Profits "Fly Out the Window"

You'll actually save money by using this modern plug gage instead of the out-moded cylindrical plug. DuBo keeps down that high cost of parts needlessly rejected or incorrectly passed. It's all in the design. DuBo plugs simply check better because of the spherical principle on which they are based.

DuBo Saves Inspection Man-Hours

DuBo is only about one-fifth the weight of corresponding conventional plug gages. This factor, coupled with "go" and "not go" color identification, definite check, ease of entry and absence of jamming, reduces inspection time, saves money and increases profitable production! **Write or phone any questions you have on this vastly better checking device.**

STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.

Two different jobs use the same fixtures --

500 MORE PARTS EVERY HOUR

Webster-Chicago Speeds Production with MULTIPRESS®

In addition to raising production from 200 units per hour to *700 per hour*—3½ times faster—this Multipress setup handles two completely different parts without any change whatsoever in fixtures and dies!

One part is handled by the day shift, the other by the night shift, producing an equal number of the two parts which are then fitted together in one of the high-precision three-speed record changers made at the famous *Webster-Chicago* plants.

In the operation, upright metal pins are staked to stamped plates—two pins in one part, three in the other—and the pins in the two parts are entirely different in spacing and arrangement.

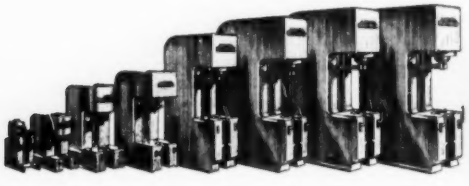
The Multipress is a four-ton model, equipped with a six-station Indexing Table tooled for the dual staking job. Ram tooling consists of a multiple-punch head with a spring stripper. Bottom dies, mounted at 6 stations on the index table, are also spring loaded, and equipped with guide pins that prevent either of the parts from being loaded incorrectly. The operator simply places the plates on the fixture and drops the required number of pins in place.

All punches in the ram tooling descend with each ram stroke, but only three make contact as the pins are staked in the first of the two plates. In processing the second plate, the other two punches are utilized. Both plates fit the same holding fixture.

A Plexiglas shield covers the front of the ram area across the entire table, with openings just large enough for the loaded tooling fixtures to pass through. For additional safety, a microswitch arrangement shuts the press off instantly if a part is not properly set in the fixture.

A counting device attached to the head of the press is operated by an arm which strikes the tooling as it progresses toward the ram station. The ejection air blast is operated automatically in a similar manner.

The fast, smooth, accuracy of oil-hydraulic action is *made-to-measure* in Multipress for hundreds of different production jobs where more speed, precision, quality, safety and economy are desired. Multipress is available in 8 frame sizes, and in capacities from one to 50 tons. Many standard accessories for special needs. Write for information on Multipress and what it can do for you.



The DENISON Engineering Company

1164 Dublin Road Columbus 16, Ohio

DENISON HydrOILics

These highly experienced, thoroughly responsible distributors (one near you) stock and recommend

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high speeds — low speeds
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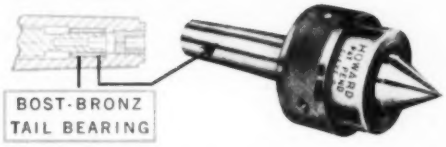
DENVER, COLORADO
DES MOINES, IOWA
DETROIT, MICHIGAN
GRAND RAPIDS, MICHIGAN
GREENSBORO, NORTH CAROLINA
HAMILTON, ONTARIO
HARTFORD, CONNECTICUT
HOUSTON, TEXAS
INDIANAPOLIS, INDIANA
JACKSONVILLE, FLORIDA
KANSAS CITY, MISSOURI
KNOXVILLE, TENNESSEE
LANCASTER, PENNSYLVANIA
LONDON, ONTARIO
LONG ISLAND CITY, NEW YORK
LOS ANGELES, CALIFORNIA
LOUISVILLE, KENTUCKY
MEMPHIS, TENNESSEE
MIAMI, FLORIDA
MILWAUKEE, WISCONSIN
MINNEAPOLIS, MINNESOTA
MONTREAL, QUEBEC
NASHVILLE, TENNESSEE
NEWARK, NEW JERSEY
NEW ORLEANS, LOUISIANA
NEW YORK, NEW YORK
OAKLAND, CALIFORNIA
PHILADELPHIA, PENNSYLVANIA
PITTSBURGH, PENNSYLVANIA
PORTLAND, OREGON
PROVIDENCE, RHODE ISLAND
QUEBEC, QUEBEC
QUINCY, MASSACHUSETTS
RICHMOND, VIRGINIA
ROCHESTER, NEW YORK
ST. LOUIS, MISSOURI
SAN JOSE, CALIFORNIA
SAN FRANCISCO, CALIFORNIA
SEATTLE, WASHINGTON
SPRINGFIELD, MASSACHUSETTS
SYRACUSE, NEW YORK
TAMPA, FLORIDA
TOLEDO, OHIO
TORONTO, ONTARIO
TRENTON, NEW JERSEY
VANCOUVER, B. C.
WATERBURY, CONNECTICUT
WILKES-BARRE, PENNSYLVANIA
WINSTON-SALEM, NORTH CAROLINA
WORCESTER, MASSACHUSETTS

take heavy loads, for example:



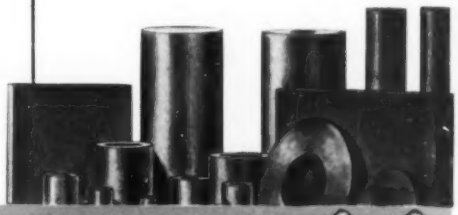
this *live-center* made by Melin Tool Co., Inc. of Cleveland, has been turning thirty ton turbine shafts for 15 months. The tail bearing is BOST-BRONZ. It's still as good as new! Frictionless and solid bronze bearings were tried but none would stand up under the terrific loads involved. BOST-BRONZ standardized, stock bearings proved the answer to years of searching for the right bearing.

STOCKED in a wide range of sizes in 6 types — cylindrical bearings, flange bearings, thrust bearings, cored bars, solid bars and plate stock.

FIVE GREAT ADVANTAGES

BOST-BRONZ Bearings are

1. *better* — interchangeable with solid bronze but superior in performance.
2. *quieter* — an oil film to start on as well as run on.
3. *cleaner* — no oil drip or waste. No openings for grit, lint or dirt.
4. *easier to use* — no machining — simple press fits.
5. *more economical* — no oil holes or grooves to machine — longer service.



GET THIS CATALOG

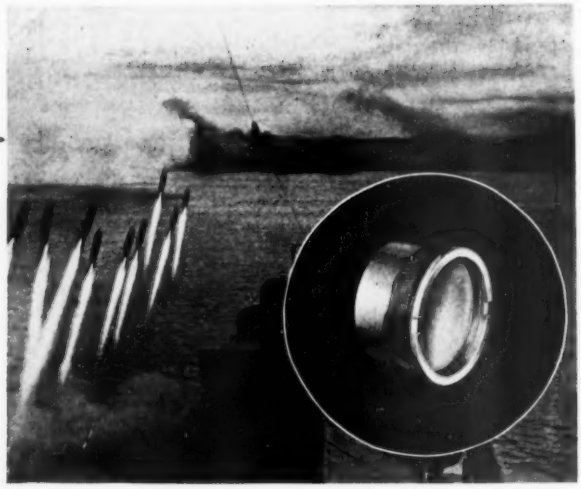
Write for Catalog 33. It contains a wealth of useful data and selection charts.

BOSTON GEAR WORKS

40 HAYWARD ST., QUINCY 71, MASS.

For Defense or Essential Civilian Use—

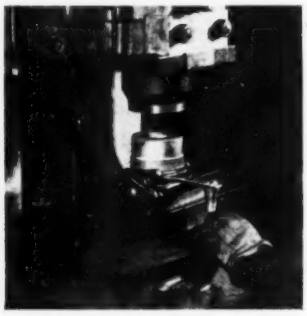
get the mo$t for your Zinc Die Ca$ting Dollar!



This protector cap for Navy rockets is one of many ordnance components now being turned out at high speed by the die casting process. *It is ZINC Die Cast in a single-cavity die at the rate of 180-200 per hour!* Only a few simple secondary operations are required to prepare this casting for its role of protecting rockets during shipment. The cap prevents moisture or dirt from entering the rocket and protects the threads from damage prior to screwing the war head in place at the point where the rocket is loaded.

CAST FAST — AT LOW COST

By using a collet die (which permits the casting of outer surface undercuts, since the cavity parts angularly in opposite directions when the die is opened) the external threads on the protector cap are obtained at high speed *in the casting operation.* Because of the relatively low melting point of the ZINC alloy, the die cost and die upkeep are minimized. Facility in casting, in combination with moderate die costs and an alloy having excellent properties, account for the preference for ZINC Die Castings.



AVOID EXTRA OPERATIONS

Since ZINC Die Castings are produced very close to finished size, the amount of metal to be removed in secondary operations is generally quite small. All that is required to complete the thread protector casting, for example, is the trimming of flash metal in a punch press. The casting is then coated with a protective dichromate film and is ready to have a steel cup press-fitted in its top end. The latter operation is speeded up by the use of permanent magnets in the ram of the press to hold the steel cup in position on the ram while it is driven home.

The same economic considerations apply whether a die casting is designed for civilian or military use. For information on these considerations, ask us—or your die caster—for a copy of "Designing For Die Casting."

●

The New Jersey Zinc Company
160 Front St., New York 38, N. Y.

ZINC
FOR DIE CASTING ALLOYS

The Research was done, the Alloys were developed, and most Die Castings are based on
HORSE HEAD SPECIAL (99.99 + % Uniform Quality) ZINC

You don't need this...

when you use this...

"RED END" BLADE

That's right! Simonds "Red End" Hacksaw Blades take less elbow grease . . . cut smooth and easy with less effort. *That's why workers like 'em so much.* And why shouldn't they? You can get "Red End" Blades for any hand job (power jobs, too) . . . made from quality-controlled steel poured in Simonds' own mills . . . and they're made right! So if you want more cutting per blade-dollar, specify "Red End"...that's for *you.* Buy through your Simonds Distributor.

THREE TYPES

STANDARD STEEL	HIGH SPEED (Molybdenum)	HIGH SPEED (Tungsten)

Hard Edge or All Hard

A "Right" Blade For Every Job!

SIMONDS SAW AND STEEL CO.

FITCHBURG, MASS.

Branch Offices in Boston, Chicago, San Francisco and Portland, Ore. Canadian Factory in Montreal, Que.

THE BIG "3"

Capable of rough cutting plus blending of welds.

Only really flexible grinding wheel ever offered.

Withstands extremely rough usage —extra safe.

BAYFLEX • DURACUT • SAF-T-CUT, reinforced abrasive disc-wheels . . . the masters of your weld grinding and finishing problems. Greater resiliency and safety make these "Big Three" products first choice in foundries, metal fabricating and welding shops.

BAY STATE ABRASIVE PRODUCTS CO.
Westboro, Mass.

Branch Offices and Warehouses — Chicago, Cleveland, Detroit, Pittsburgh
Distributors — All principal Cities
In Canada: Bay State Abrasive Products Co. (Canada) Ltd. Brantford, Ontario

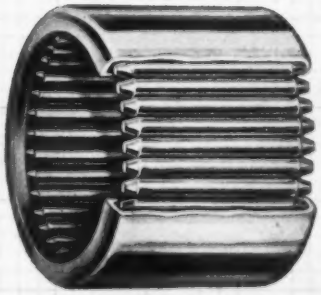
BAY STATE

Send for latest information-packed "BIG-THREE" catalog. It contains such data as mounting instructions, recommended speeds, charts, specific applications, etc.

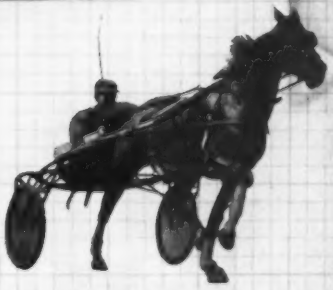
thoroughbreds...
for high speed operation

Torrington Needle Bearings are ideally suited for a wide range of operating speeds—5,000...10,000...15,000 rpm and higher. These smooth-running bearings—equally efficient for rotating or oscillating applications—have low coefficients of starting and running friction. Thus, power requirements are reduced.

Other Needle Bearing advantages—high radial load capacity, light weight and compact size—aid in simplifying design as well as increasing efficiency. Why not get full details in terms of your own product? Write today.



THE TORRINGTON COMPANY
Torrington, Conn. • South Bend 21, Ind.
District Offices and Distributors in Principal Cities of United States and Canada



TORRINGTON *NEEDLE* BEARINGS

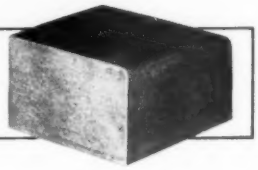
NEEDLE • SPHERICAL ROLLER • TAPERED ROLLER • STRAIGHT ROLLER • BALL • NEEDLE ROLLERS

SAVE STEEL . . . MANPOWER . . . MACHINING WITH

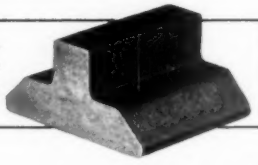
DISSTON® HOT ROLLED SHAPES

How Firestone Tire & Rubber Company saves 45.2% steel in making special jet engine container rims:

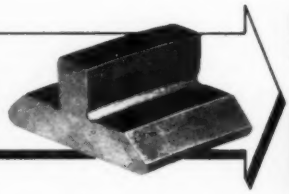
INSTEAD OF THIS—a full-section steel bar weighing 9.86 lbs. a ft. . . .



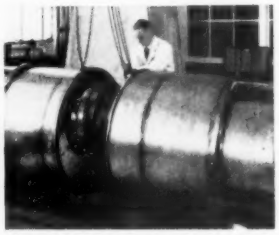
THEY* START WITH THIS—a Disston Shape, hot-rolled to close tolerances, weighing only 5.4 lbs. a ft. . . .



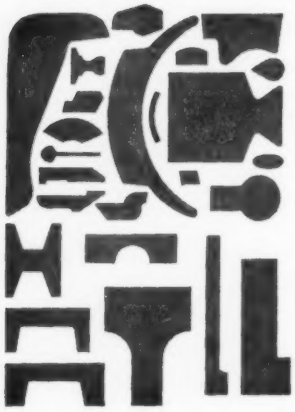
TO MAKE THIS—the finished rim weighing 4.14 lbs. a ft. Only 1.26 lbs. need be machined off each ft. of metal instead of 5.72 lbs.!



*Machining and rim fabrication by Dresser Manufacturing Div., Bradford, Pa.



Firestone's jet engine container is in two halves which are attached by a series of clamps affixed to a machined rim. This rim is made from a special Disston Hot Rolled Steel Shape and helps make a joint capable of carrying structural loads.



A few of the many forms of Disston Hot Rolled Shapes now being used by industry.

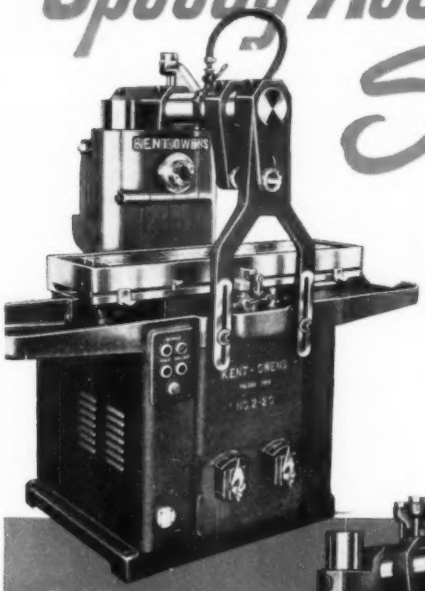
This actual case history demonstrates typical savings made for many industries using Disston Hot Rolled Steel Shapes. Such shapes can be rolled in a variety of forms to meet exact specifications. Tolerances are close, and fine finishes can be furnished. These shapes can be made in either alloy or carbon steels, in both electric and open hearth grades. Disston engineers and metallurgists will be glad to work with you in developing the special shapes that will give you the greatest economies. Write us, specifying your needs.

FIGHT WASTE

SCRAP TURNED IN IS STEEL TURNED OUT!
Steel mills urgently need more scrap *now!* Help yourself get more steel by keeping your scrap moving into channels serving steel mills.

HENRY DISSTON & SONS, INC.
920 Tacony, Philadelphia 35, Pa., U.S.A.

Speedy Accurate Milling Saves Labor!



On countless jobs—Kent-Owens Milling Machines have shown ability to turn out work with top speed and high accuracy. They're designed for rapid, easy set-up and operation. Rugged . . . with twin-post head mounting that assures balanced load—no chattering. Practical features throughout to help you *produce more* . . . with *lower costs!* Write for bulletins on the Kent-Owens Standard line . . . including wide range of hydraulic and hand operated machines. Also, let our engineers help you with tooling and special machine requirements.

Kent-Owens Machine Co., Toledo, Ohio.

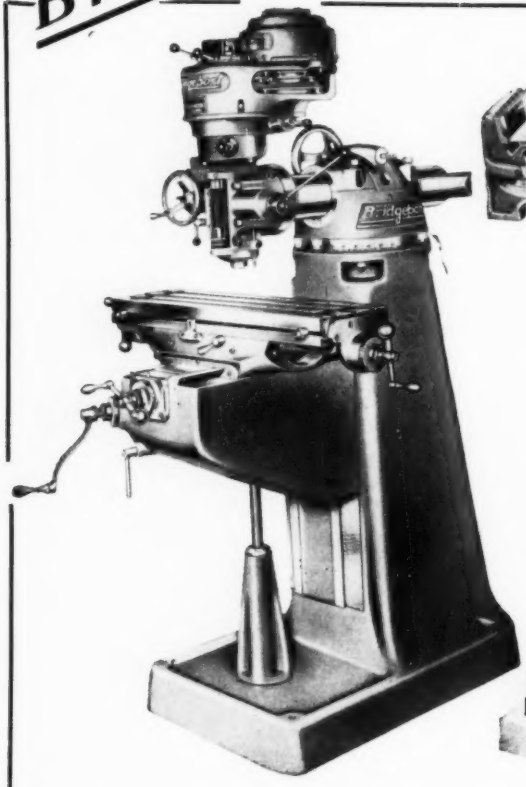
No. 2-20 . . . 20" table travel . . 42" x 12" table . . . full automatic hydraulic feed.

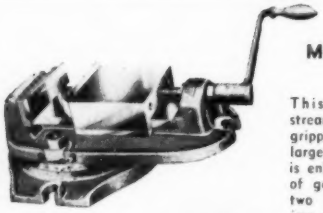
No. 2-20 DS . . . Double Spindle for two milling operations . . . 20" table travel . . . 42"x12" table. Hydraulic feed.

No. 2-20V . . . 20" table travel . . . vertical spindle with speed range 32 to 1284 R.P.M. . . . 42"x12" table. Hydraulic feed.

Call on KENT-OWENS For Milling Machines

The Bridgeport makes sales records because it makes time and effort savings





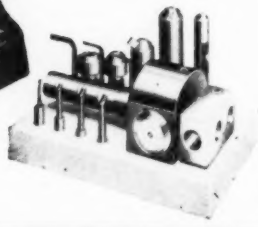
MILLING MACHINE VISE

This improved, attractively streamlined vise assures greater gripping power provided by a large diameter screw. Its utility is enhanced by a coolant trough of generous capacity. Made in two sizes: 5"x3½" and 6"x5" jaw openings.

RIGHT ANGLE ATTACHMENTS

(Left) Heavy Duty attachment (made in two sizes) applicable to Master as well as 1 HP Bridgeport heads.

(Right) Light Duty type for milling and drilling narrow, deep molds and cavities.



No. 2 BORING HEAD

This attachment provides the means for boring holes up to 6" diameter. It is applicable to Bridgeport 1 HP Milling, drilling and Boring Attachments.

It's not mere chance that Bridgeport Turret Milling Machines have established all-time high records for the number of machine tools of a given size and type delivered over a specified period of time.

The reason why so many thousands of these units are in everyday service (and being shipped in ever-increasing numbers) can be traced directly to the exclusive features which Bridgeport and Bridgeport only provides: *ability to mill, drill, bore and shape at any angle of the work without changing set up.*

These features mean faster work, greater accuracy, outstanding versatility and all-round convenience. They are unique features which make it possible to utilize the maximum number of available machine hours *productively*.

With its recently developed 1 HP head and attachments, the "Bridgeport" is now handling a much wider variety of heavier work in the tool rooms, die shops and on the production lines of our metalworking plants . . . another evidence of its outstanding popularity.

Get *all* the facts TODAY.

Bridgeport MACHINES, INC.

Bridgeport, Connecticut

Manufacturers of High Speed Milling Attachments and Turret Milling Machines

Any Speed YOU NEED

WITH

GEARMOTOR

. . . because it is available in single, double or triple reductions, offering a range of speeds: 780 through 7.5 r.p.m. Motor rating from 1 h.p. through 60 h.p.—A-c or D-c. The motors and gear units are each self-contained and readily separated . . . gears in multi-reduction units may be inspected, without uncoupling from driven machine.

These small, compact, self-contained units simplify the direct application of electric drive to individual machines.

GearMotoR conforms to the recommended standards of the American Gear Manufacturers Association and the National Electrical Manufacturers Association.

Send for 42-page illustrated catalog, containing full information and data necessary for ordering, and please use your Business Letterhead when requesting same.

Philadelphia Gear Works, INC.

ERIE AVE. AND G ST., PHILADELPHIA 34, PA.

NEW YORK • PITTSBURGH • CHICAGO • HOUSTON • LYNCHBURG, VA.

IN CANADA: WILLIAM AND J. G. GREEY LIMITED, TORONTO

Industrial Gears and Speed Reducers
LimiTorque Valve Controls

ANOTHER RED RING "First"

100" Gear Shaving Machine

The first gear shaving machine of its type ever built is the new Red Ring Model GCT which shaves both internal and external spur and helical gears with pitch diameters up to 100" and face widths up to 40". It is especially applicable to the large gears used in tanks, power shovels, mine hoists, speed reducers, stationary prime movers and marine drive units.

Outstanding characteristics of this machine are its high degree of accuracy in shaving large gears, its ingenious aids to rapid loading and unloading and the ease with which it can be set up.

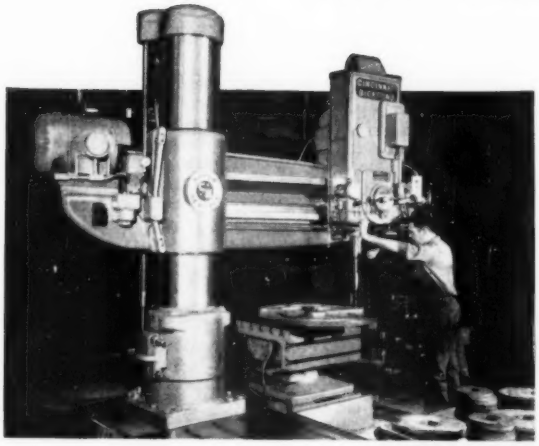
Red Ring Shaving Machines are available for gears from ¼" to 200" in diameter.

Write for Detailed Description

SPUR AND HELICAL GEAR SPECIALISTS
ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORM

NATIONAL BROACH & MACHINE CO.
5600 ST. JEAN . . . . . DETROIT 13, MICHIGAN
WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

Now *one hour's work,* *in* 40 minutes



The Carborundum Company, Niagara Falls, New York, famous manufacturer of abrasive products, has this 6′ arm 17″ diameter column SUPER SERVICE Radial Drill performing in twenty minutes, operations that previously took thirty minutes. Like many other enthusiastic users of the SUPER SERVICE Radial, these people feel that the savings they are now experiencing with this machine is due to the suitability of this machine for their type of work, and the ease with which the SUPER SERVICE Radial handles.

Notice the use of the strong and accurately built universal table. It is used here on a base extension especially provided so that the main base can remain available for big work. Convenient controls, always within easy reach of the operator, thirty-six speeds and eighteen feeds, combine to make available the right combination for the drilling, tapping, reaming or counter-boring tool involved.

Correct, safe manipulation is easy on the SUPER SERVICE Radial. For further information on the many exclusive features of the SUPER SERVICE Radial, write for Booklet R-29.

RADIAL AND UPRIGHT SUPER SERVICE DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9, Ohio U.S.A.

"I told you not to let him in! He has a grip like a JACOBS CHUCK!"

IF IT'S A JACOBS IT HOLDS

THE JACOBS MANUFACTURING CO., WEST HARTFORD 10, CONN.

Backlash

EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

You're Old, Father William

Mr. Colvin brings to the forefront (*AM.* July 9) a subject that has been preying on my mind since the beginning of the last war, when it was evident that skilled labor was too scarce to meet the emergency. While I am not yet asked to be skidded into the discard along with the rest of the sixty-fivers, I am getting pretty near the brink.

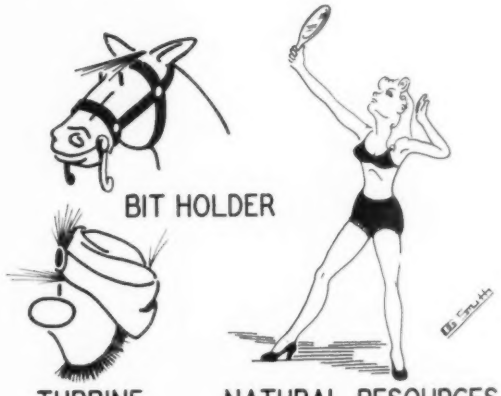
There certainly is considerable fallacy in the idea of retiring skilled labor at such an "early" age—the age when the wisdom and judgment acquired through years of experience is shunted foolhardedly into the discard. The worth of a man is not determined by output alone; we've got to consider his loyalty, and his sense of judgment. It's all very well to say the younger man is physically superior and that he possesses the necessary oomph to turn out the work in quantity, but the long-time effect of his efforts results, only too often, in unnecessary wear and tear on the equipment.

It seems strange that the experts in the field of human research don't take into consideration these things that eventuate in higher overhead. The life span of man is mounting higher and higher, yet the leaders in industry are hoodwinked by men who claim that man becomes useless after reaching 40 years. Certainly a man is entitled to a comfortable change when he reaches 65, provided he has some hobby to take up his time. But for the man who loves his work—and there are many who do—forced retirement for chronological reasons alone is nothing short of tragic.

A friend of mine was recently retired from his job as chief machine designer, and when I asked what he was going to do, he replied, "Oh, I'll still do the designing for them, but I'll do it at home, under contract,

GRINETICS

BY D. G. SMITH



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Tool Steel Topics

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

High-Speed Tools at Lower Cost with Tungsten-Saving 66HS

Bethlehem 66HS performed so well during the alloy shortages of World War II that many users of high-speed steels never did go back to the large-scale use of 18 pct tungsten grades. 66HS has a balanced content of tungsten and molybdenum; and it has proved ideal for a wide variety of cutting tools. Because of its lower cost and many uses it is much more than just an able substitute for the high-tungsten steels.

In Bethlehem's own machine shops, for example, 66HS has been used since 1942 for more than 90 pct of all our high-speed tools. We use many tons of it each year; and our production men report that year after year this grade performs just as well or better than Special HS, our 18-4-1 type of steed.

There's an economy angle to 66HS that shouldn't be overlooked, especially by large users. 66HS at present prices costs about $700 a ton less than standard 18-4-1 grades. And it's 6 pct lighter, too.

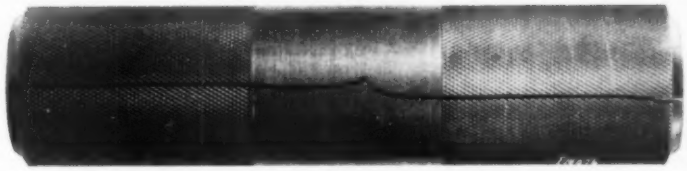
66HS is hardened at 100 degrees below the hardening temperature for high-tungsten grades. It requires careful heat-treating, but it presents no problem at all to any heat-treater who has accurate temperature indicators. This equipment is necessary because 66HS does *not* form beads of "sweat" on the surface when the proper hardening temperature is reached (2250 to 2275 F).

66HS has just the right degree of wear-resistance, toughness, and red-hardness for use nearly everywhere as a dependable, general-purpose cutting steel.

Its typical analysis:

C	W	Mo	Cr	V
0.83	6.35	5.0	4.15	1.90

Like to know more about it? Ask for our Booklet 264, describing 66HS and other Bethlehem high-speed steels.



This 1⅜-in. diameter gage, made from oil-hardening tool steel, cracked because it wasn't tempered immediately after the quench. Tempering relieves stresses set up in the steel during hardening.

Tool Steel Troubles Usually Have Happy Endings

Based on the many thousands of investigations they've made, our metallurgists and research men say that probably less than 3 pct of tool failures can in any way be blamed on the tool steel.

Tool failures are usually cured by one or more of these remedies:

1. Improving the tool design
2. Using a more suitable tool steel
3. Correcting the heat-treatment
4. Improving tool-grinding technique

Some people who think they don't have tool problems quite often aren't getting best results. For example, a plant may suddenly have a series of broken tools or dies. We're called in to help put a finger on the cause. And quite likely we'll find they have been overlooking some vital factor in tool design or heat-treatment. Correcting the trouble leads to tool performance that's far beyond the best previous service life. That's why most tool steel troubles have a happy ending.

If you have a problem involving tool steel or feel you should be getting better tool performance, let us hear from you. Maybe we can give you the right answer pronto. Or a Bethlehem metallurgist may have to work with you in your shop. In either case, there's no obligation.

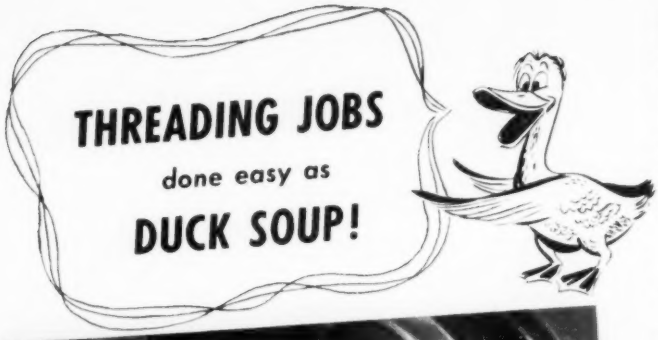
Our Tool Steel Engineer Says:

Making shock tools too hard causes premature failure

Most shock-resisting tool steels give best service when hardened between Rockwell C-55 and 60—averaging about C-58. This hardness range provides the best compromise between toughness and wear-resistance. Premature failure is often the result of obtaining an excessively high hardness in these grades. Carbon tool steels are often best for shock tools requiring a hardness above Rockwell C-59.

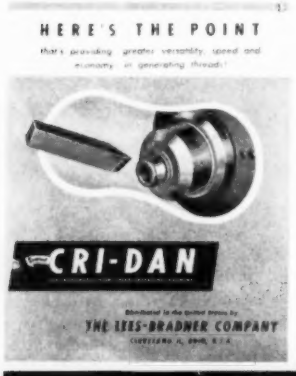
The chrome-tungsten grades of shock-resisting tool steel can be carburized to obtain greater wear-resistance. This treatment produces a thin, hard case on the tool surfaces, yet retains a tough core of lower hardness. This method is often used for master hobs, reamers, swaging dies, and various kinds of shock tools.

Bethlehem ULTRASONIC TESTED **Tool Steel**



CUTS THREADING TIME FROM MINUTES TO SECONDS!

Send us your specifications and we'll gladly give you an estimate of the time and money Cri-Dan Single Point Threading will save for you!



NEW DATA on Cri-Dan Single Point Threading is contained in this new Bulletin . . . If you do threading jobs you'll want to be posted on the advantages and economies obtained by generating your threads with the Cri-Dan.

Consult your Lees-Bradner representative . . . ask for Bulletin 85-A.

The LEES-BRADNER Company
CLEVELAND 11, OHIO, U S A

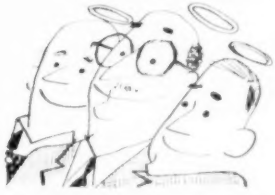
and make more money than before."

Now, Doctor What's Your Name and your many followers of old-age science, what have you to say about that one?

We need production and more production to uphold our way of life, and it is necessary for every man to put forth his best efforts to that end whenever he is physically and mentally fit—provided, of course, that it is his wish to work.

The International Typographical Union has a plan that may give us an idea for remedying the unfair plan now in force in many plants: A member may work as long as he is able to turn out a fair day's work. If there is any question, it is settled by a proficiency test administered by a standing committee made up of representatives of the union and the management. If he cannot produce up to the required standard, he may keep at work at reduced pay, doing the things normally allotted to a semi-skilled worker. Or he may retire if he has reached 60 and has been a member for not less than 23 years. A retired printer may, if work is available, work as much as two days a week at his trade without bringing any reduction in his retirement pay.

Jack Everett
San Francisco, Calif.



Revolt of the Sexagenarian

In answer to Mr. Colvin's article (*AM*, July 9) may I say that I am 60 years old, and have just been promoted to my first executive position. I have spent my entire working life with this one company, from the day I started as an apprentice kid, and have worked my way up to machinist, foreman, department supervisor, general superintendent, and now plant manager. We've gone through lush times and tough times, and I know every man in the plant and what he can and cannot do. I've learned lots of tricks for getting out a job in a hurry, I know how to save pennies when it's a question of underbidding a competitor, and I know how to get the best out of my men and make them like it. In short, and without bragging, I'm a mighty useful man to the company.

But here's the rub. We have a com-

IT'S IMPORTANT

To SAVE MAN HOURS
REDUCE PRODUCTION COSTS
INCREASE EFFICIENCY
That's Why It Will Pay You to Investigate

Vertical Air Hoists for Low Cost Lifting or Lowering of Materials or Machines

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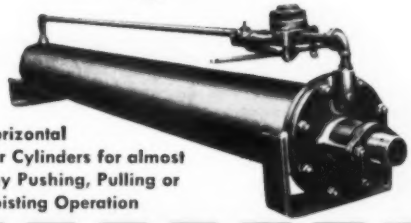
AIR COMPRESSORS
AIR-OPERATED CYLINDERS & HOISTS

Tank Mounted Up to 15 H.P. Inclusive— Air Cooled

Water-Cooled Compressor, Up to 50 H.P. Fully Enclosed

- Dust and Dirt Proof
- Carbon Free Valves
- Timken Bearings



Horizontal Air Cylinders for almost any Pushing, Pulling or Hoisting Operation

I-51-1R

Curtis equipment has stood the test of time, because it is precision made from top quality raw materials with 97 years of "know how."

CURTIS PNEUMATIC MACHINERY DIVISION
of Curtis Manufacturing Company
1924 Kienlen Ave., St. Louis 20, Mo.

I am interested in items checked below:

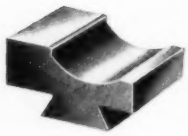
☐ **AIR HOISTS**
Stroke? ☐ Capacity? ☐

☐ **AIR CYLINDERS**
Stroke? ☐ Capacity? ☐

☐ **AIR COMPRESSORS**
Capacity? ☐ Pressure? ☐
Current? ☐

Name.....
Firm.....
Street.....
City.....Zone.....State.....

with *Gorham*-ENGINEERED SPECIAL CUTTING TOOLS



Next time you're up against a tough tooling problem, call in the man who can give you *the right answers fast* . . . your nearby Gorham Field Engineer! He's an expert in special cutting tools . . . and he's ready to provide a complete engineering service to determine your exact tooling requirements. He starts with your product, sketch or idea. He surveys your production operations and available equipment. He considers work material properties and desired finishes and tolerances. He plots proper machine feed, speed and method of tool driving. Then he develops practical design and engineering specifications for special cutting tools, metallurgically "tailor-made" for your application.

His recommendations are backed by Gorham's unmatched facilities, which include three fully-equipped modern plants, a large Engineering and Metallurgical staff, and a force of field application engineers in principal industrial centers, coast-to-coast. All are dedicated to furnishing prompt and profitable solutions to your special tooling problems. Gorham-engineered "specials" are turning problems into profits in thousands of plants every day . . . why not let them do the same for *you?* If you haven't met your nearby Gorham Field Engineer, write for his name, or send details of your problem direct for recommendations.

Gorham TOOL COMPANY

"EVERYTHING IN STANDARD AND SPECIAL CUTTING TOOLS"

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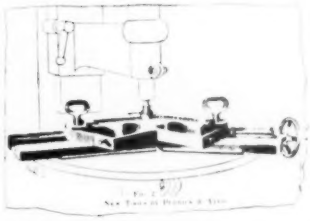
pulsory retirement plan at age 65, and that means I have only five years in which to do the best work of my life. The company has been going downhill for the past few years but give me 8 or 10 years and I can put it right back on top of the heap again. But no. In five more years, out I go, before my plans have had a fair chance to bear real fruit.

The company, and the stockholders, will be the real sufferers. Me? Well, I'm seriously thinking of gathering up a few other decrepit old crocks I know, and starting up my own business in direct competition. You see, I know all about my present company, its strength and its weakness, and I know I can give them a real run for their money. I won't have any labor troubles; not with a bunch of sixty-fivers; and what we may lack in speed we can more than make up in know-how.

I sort of hate to do this, because it may hurt a lot of people who have been real good to me, but I don't look forward to just sitting around and feeling miserable. No rocking chair for me, thank you, not at 65 I might consider it when I'm 95.

R. T.
Cleveland, Ohio



We Repeat

With reference to the article (*AM*, p.158, Feb. 5th, 1951) I would like to draw your attention to the fact that this principle was illustrated in *AM*, Feb. 21st, 1889, as shown in the enclosed picture.

As Fred Colvin has so aptly remarked, "History repeats itself frequently in each generation."

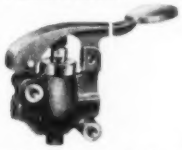
This same principle of determining large radii is also used for grinding the radius in glass tubes for precision levels.

Jack Finlay
Lithgow, N.S.W.
Australia

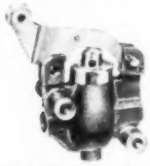
We commented recently (AM, Aug. 20, 1951) on a reader who remembered an advertisement published in 1886. But here's one who remembers the editorial content of 1889. That makes an editor feel even better.—ED.

Schrader Valves— Practical answers to air control problems

To meet the vast and increasing variety of applications for air cylinders and other air line accessories, Schrader supplies a comprehensive range of equally useful control and operating valves for operation by hand, foot or cam. Shown below are just a few from Schrader's more than a hundred models.



Hand Lever—This is one of the many Schrader hand operated valves. Brass body with stainless steel parts. Can be mounted rigidly at any angle. Specially constructed lever makes operation easy and



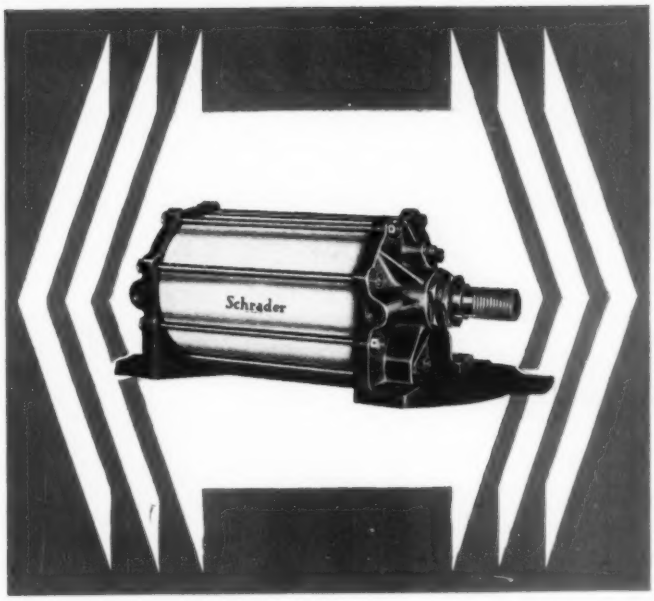
Valves with roller lever—These valves are designed for any cam actuation. The free turning roller riding on a cam provides long life by reducing friction.

Pilot valves—Both two and three way, with or without timer. Normally open or normally closed. Provides instant power at remote points.

Foot Lever—This valve supplies line pressure to single acting cylinders. It is functionally designed for "tip-toe" operation.

Air Cylinders • Operating Valves • Press & Shear Controls • Air Ejection Sets • Blow Guns • Air Line Couplers • Air Hose & Fittings • Hose Reels • Pressure Regulators & Oilers • Air Strainers • Hydraulic Gauges • Uniflare Tube Fittings

Schrader
PRODUCTS
CONTROL THE AIR



Four ways that air cylinders can increase production in your plant

You can make hard work easy, eliminate manual effort and speed up production by the application of air power . . . often the best, usually the economical way to apply force where you need it. For example:

- ***To provide a powerful push***
- ***Where clamping is necessary***
- ***For lifting operations***
- ***To power a reciprocating motion***

Schrader Air Cylinders are increasing production through safer, faster and less fatiguing operations, in many thousands of applications in plants throughout the country.

Undoubtedly there are many places in your own plant where Schrader Air Cylinders will be just the thing. Ask us to help you determine what will best fit your needs. Send us a letter outlining your particular requirements, your idea, or fill out the coupon below.

Mail This Coupon Today

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Division of Scovill Manufacturing Company, Incorporated
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Please send me further information on the Schrader Air Cylinders and Valves.

Name _____ **Title** _____

Company _____

Address _____

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in America's Rearmament

KING VERTICAL BORING & TURNING MACHINES

Key men in defense production know the vital part KING® mills played in World War II. That's why in the present rearmament program they're again coming to KING for powerful, versatile machines that meet every boring, facing, and turning requirement. 10 sizes—30″, 36″, 42″, 52″, 62″, 72″, 84″, 100″, 120″, and 144″. Full details supplied promptly on request.

American Steel Foundries

KING MACHINE TOOL DIVISION

CINCINNATI 29, OHIO

SPOT NEWS of Metalworking

- **In new British material-treating process,** chromium can be diffused into carbon steels and iron to depth of 0.15 in. to impart a heat-, corrosion-, and wear-resistant case. Case is homogeneous and becomes integral part of base material. Part to be treated is packed in mixture of ferrochrome powder and other chemicals, then subjected to 1500-1900 F. Experimentally, chromium carbide case has been imparted to files and saw blades, conceivably may be applied to carbon tools to replace high-speed steels.

- **Four to six months tank- and automotive-production time** is being saved by Army Ordnance in authorizing field procuring installations to issue letter order contracts up to 50% of total estimated contract price and to execute definitive contracts up to $10 million without submission to Washington. Procedure enables manufacturers of long lead-time items to begin production without delay.

Cadillac Tank Plant, Cleveland, is completing installation of largest X-ray testing machine ever built—a 1-million volt machine. Plant is just getting under way on production. Most of machine tools installed were especially designed or altered from standard machines to a point where the maker would scarcely recognize them.

- **Big changes in US jet research** and design likely to follow recovery of Russian MIG-15 from Korean waters by British, US and ROK navies. Engineers at Wright-Patterson AF Base are working to restore the plane to flight condition or make an American copy for test against US planes. Recovery of plane gives engineers new knowledge of Russian production techniques, such as how Russians licked problem of developing alloys that will withstand terrific temperatures found in jet propulsion.

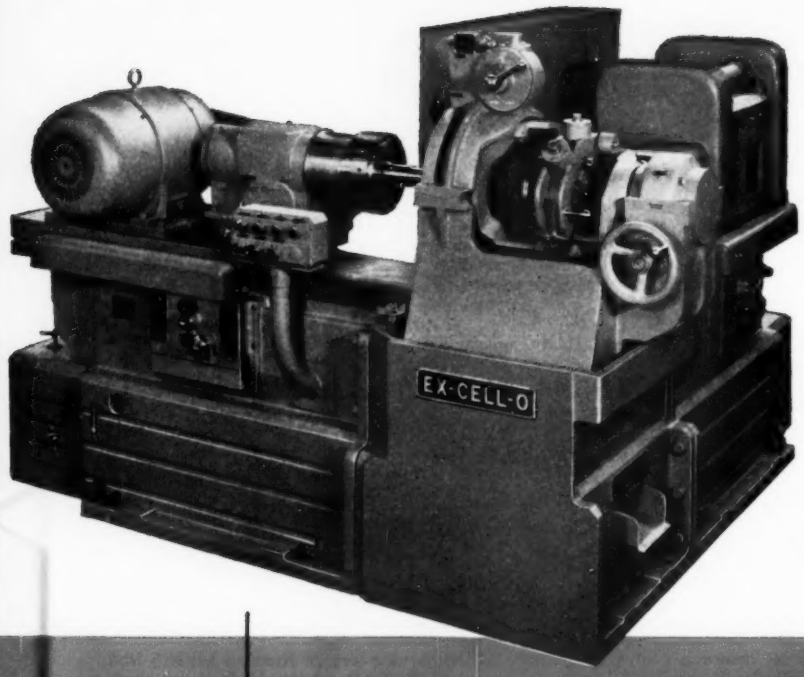
- **Stainless steel tubular construction** of jet-engine combustion chamber, as used by Russians in improved version of British Nene jet, believed by US engineers to give stronger construction than either US or British methods. American experts also believe now that heat-distribution problems can be solved by making use, as Russian Nene does, of large numbers of perforated rings staggered through the chamber.

- **British are putting new Hawker fighter plane** into immediate production following successful first flight. It's said by British to be faster and have higher performance than Russian MIG-15 or American F-86. Also developed is new four-jet bomber superior to Canberra in range, speed, altitude and load-carrying capacity.

Maritime Administration will sponsor an attempt to recover some of the 125 vessels sunk off U. S. coast during World War II. This purpose is to help overcome steel and critical material shortages. If the program proves feasible, maritime will attempt to recover known sunken cargoes of tin ore and copper plate. Bids are invited now for recovery of two tankers in about 60 feet of water off Gulf Coast.

- **Cathodic protection of tanks,** pipes and power cables extends their useful life by five to ten years, Navy's Bureau of Docks engineers have found. This safeguard against galvanic and electrolytic deterioration is maintained artificially by providing dc power at strategic point, with current flowing toward the metal to be protected. High-quality magnesium anodes so used have effective life of ten years.

- **Transfer of Selective Service files** from board where an employee registers to a board near where he works has been authorized. Employee must request the transfer. This means that a company, instead of working with a multitude of local boards as during World War II, need deal with only one or a few. Saving in administrative cost alone can be enormous, particularly for companies employing large numbers of men from distant areas.

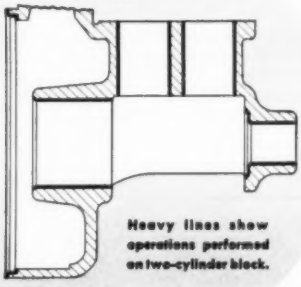


Ex-Cell-O Two-Way Precision Boring Machine, with fixture that accommodates two- and three-cylinder in-line refrigerator compressor blocks; four- and six-cylinder V-type blocks.

XLO
EX-CELL-O *for* PRECISION

EX-CELL-O

WAY MACHINE BORES CYLINDERS AND CRANK BEARINGS SIMULTANEOUSLY



Heavy lines show operations performed on two-cylinder block.

ACCURACY OF 90° ANGLE IS BUILT INTO MACHINE

This Ex-Cell-O Way Machine precision bores cylinders and crankshaft bearings of refrigerator compressor bodies, holding a 90° angle between the bores within .001″ in 14″. When operations from two directions are performed on one machine the possibility of error in relocating and reclamping the part for each operation is eliminated. Thus the accurate relationship of one operation to another is built into the machine. And of course, doing the operations simultaneously saves time and money too.

Ex-Cell-O Way Type Precision Boring Machines are built up by combining standard way units with a center section and adding tooling to fit the job. Standard way units are economical, self-contained, and can be used over and over again in different combinations. For full information, contact your local Ex-Cell-O representative, or write Ex-Cell-O in Detroit today.

EX-CELL-O

51-2

CORPORATION
DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • CUTTING TOOLS
RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT
AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

Washington

Fast amortization is in for a sweeping change. Mobilizer Wilson's 60-day moratorium against issue of Certificates of Necessity gives DPA a chance to change the whole program.

Trouble was that DPA approved plant expansion without regard to supply of structural steel. Result: Lots of licenses to expand but no materials.

Now DPA, through its invigorated Production Executive Committee, will balance certificate applications against: Supply of structual steel; other government aid to the applicant; and, nature and kind of defense work he's doing. Also forthcoming is a list of what kind of expansion is still needed for mobilization.

• • •

Shipyards may soon feel the employment pinch. Right now there are 67 ocean-going vessels under construction in private yards plus another 20 for inland water service. That's a total of 1.5-million tons, not to mention tugs, barges, yachts, etc.

Excluding repair, there are about 28,000 workers engaged in new construction with room for another 12,000. In addition, Navy construction and repair in Naval shipyards is siphoning off available workers.

And, Naval shipyards are beginning to fill up with a backlog of work that may soon spill over into private yards. Result will be a bigger shortage of skilled workers.

But steel still governs construction. And, DPA boss Manly Fleischmann isn't convinced that new fast freighters now under construction for Maritime are urgently needed. Result is that many of the yards now sharing in the $325-million program for the mariner class ships are slowed down by lack of steel.

Rumor is that Bethelehem, notably, is in bad shape. The company has 15 freighters and 13 tankers now under construction. DPA thinks that the ships in the reserve fleets should be used before new construction is undertaken.

• • •

We're already using copper stockpiles. When the smelter strike at Garfield, Utah, cut production, mobilizers had to dip into the US stockpile for 25,000 tons. It was that or again cut copper users.

Copper is Jess Larson's biggest headache as head of the new Defense Materials Procurement Administration. He's got a lot of responsibility for expanding minerals production, but not full authority. Up to now, only a small production expansion has been planned, and biggest part of this was stalled while GSA wrote a government purchase contract.

US price ceilings are holding down imports, and the government is afraid to go into the world market for fear of running up the price. Even if Larson gets stalled projects started—with approval of DPA and GSA—chances are he won't come up with enough copper or other scarce metals to help over the next several years.

• • •

NPA is trying to restore trade channels disrupted by CMP. That's the trade between mills that produce controlled materials, and their normal customers.

Mills thought that they had to accept ACM (Authorized Controlled Materials) orders as received—first come, first served. Order boards filled up early and mills had to say "no" to customers they had served for years even though they had CMP tickets but were late in getting them in.

NPA is now publishing a policy that allows mills to pick what ACM orders they want to accept, except for military orders and orders received within 15 days of the required lead time.

• • •

Government Wage Policy is now set. It boils down to this: Wages will be allowed to rise with the cost of living for everybody, if the boss is willing. An escalator plan is not necessary. You can give the old 10% plus enough to keep the price-wage ratio of last January.

It means a sixth round of wage increases of about 5% this winter. In steel, it will come to about a dime. A little more in coal next spring.

• • •

You can pay your executives the same bonus you paid them last year. That's all the Salary Stabilization Board's profit-sharing regulation amounts to. It's strictly stop-gap while rules for new or improved bonus plans are worked up.

• • •

Use of higher wages to attract labor is being discouraged. The Wage Stabilization Board's enforcement commission is cracking down on violators who pirate workers with above-ceiling wages. And, Wilson has laid down terms under which wage increases may be approved for manpower purposes.

• • •

Before WSB will consider manpower wage increases, manpower officials must certify that all other means of attracting the needed workers have been exhausted. And, procurement officers must report on the urgency of the production to the defense effort.

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We maintain four processing plants and warehouses:

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We assume full responsibility for the results obtained with your honing equipment. As the principal manufacturer of honing equipment for over twenty years we have a large, experienced staff of Honing Engineers and Service Technicians. The accumulated know-how of this organization plus the technicians of the three abrasive companies are at your service when you BUY MICROMATIC HONING ABRASIVES.

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Write for your copy of Cross Hatch on MICROHONING ABRASIVES

Detroit

Go around the automotive community and ask the effect of materials regulations—notably the Controlled Materials Plan—and you get one reaction: confusion.

CMP allotments for steel are coming through out of balance at many points—larger allotments for steel than for copper, or vice-versa. They are reported late enough at others that mill books are closed for the period covered. In all events the timing is tight to the point that medium-term scheduling of the kind the auto makers like to employ is not feasible.

• • •

Washington moved late in August to try to correct this by extending to Sept. 15, the deadline for displacement of unrated orders by validated CMP allotments. That is, unrated orders can remain on the books till then, pending receipt of allotments.

The materials problems are shortening up the supply of many key spare automotive parts. Electrical wiring is in tight supply. So are spark plugs, numerous other components.

Lead pricing is cited as an example of confusion in government planning. Efforts seem in process to hold domestic prices down to world quotations—and still an import duty continues on foreign metal.

• • •

There are satellite problems. The Alcoa-Cleveland strike set back shipments of aluminum pistons from there. Aircraft engine output in at least the small to medium power ranges are in jeopardy.

Don't get the impression Detroit is tearing its hair. It isn't. But it is bothered, concerned, unsure, wondering if the mess will clear up soon.

• • •

You read about the so-called scandals at the Detroit Tank-Automotive center — officers accepting favors from contractors. Much opinion around town is that investigating Congressmen were determined to find a goat.

What you haven't read is that the process of closing new contracts has slowed down to a walk. Contracting people are very wary about everything they do. At the National Air Races in Detroit in mid-August military people were all but afraid to be seen talking in public to representatives of civilian suppliers.

That ordnance center, incidentally, is proud of the job it has done—and has reason to be—on standardization. Tank engines are the much publicized example. But the process runs down to spare rivets, screws, grommets and the like. The order of the day is interchangeability.

• • •

Intriguing mechanical gimmick in some new Continental Motors engines for Army ground use in fairly fixed speed installations: A kind of speed governor, actuated by engine load. As load increases, manifold pressure actuates the throttle—that is, the load requirements determines the throttle setting. It's equivalent to a governor, but supposedly is more saving on plugs, etc.

• • •

Castings out of Michigan foundries are currently in rather easy supply. Some lag in farm equipment plant production accounts for much of this. Last war, you recall, castings were a great bottleneck. They may be again, when military production gets higher, but it's not nearly in sight yet.

• • •

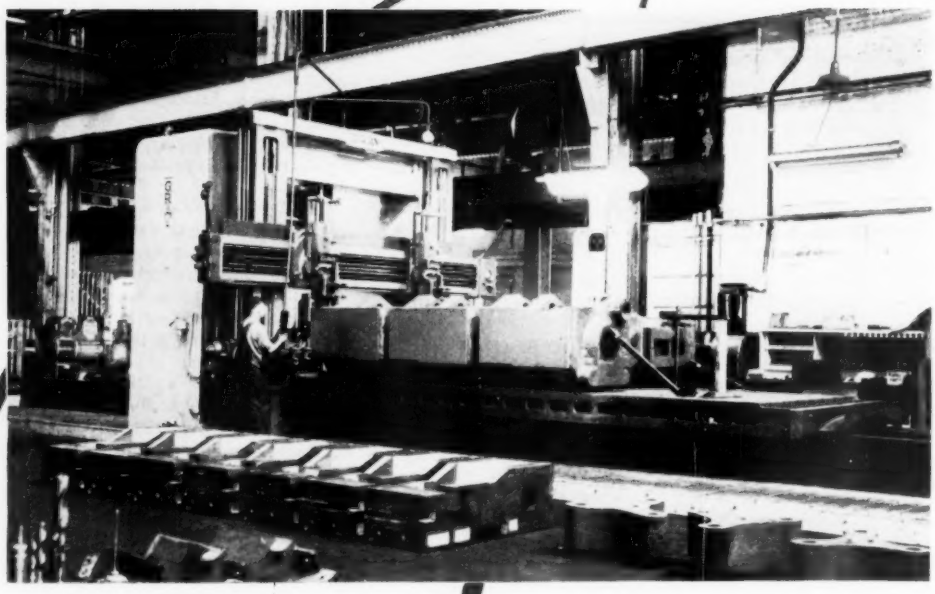
Automobile production is fluctuating uncertainly. It reached to about 130,000 cars and trucks, US and Canadian output combined, during August. The first September week, including Labor Day, was to see a large holiday-induced decline. After that the anticipations were for lower volume than during August.

Sales in the field improved contra-seasonally during August. The apparent reason: consumer anticipations of higher prices. As soon as the major manufacturers went to Washington seeking advances around 10%, word on that reacted among on-the-fence buyers. Coupled with the lower output rates, that had the effect of reducing field stocks somewhat.

• • •

The slackening forward pace of manufacturing has helped in modifying schedules at the parts plants. This, coupled with the present letdowns and with the uncertainty in the minds of individual workers, has led to a broad hiatus in retail buying in the Detroit area. Downtown stores are complaining loudly, trying every sales stunt in their repertoire, finding none of them too effective.

DEFENSE MOBILIZER Charles E. Wilson (center) inspects Hotpoint's jet engine plant at Chicago. Flanked by James J. Nance, Hotpoint president (right) and Fred J. Walters, vice-president — defense, he views first production of combustion chambers and compressor cases for Pratt & Whitney J-48 jet engines



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. . . with interrupted cuts can be done faster, better and more economically on a GRAY.

This 4-head GRAY PLANER working on hard, close-grained iron, has the enormous power and absolute rigidity needed to take heavy roughing cuts and accurate finishing cuts on interrupted surfaces.

. . . can your planers do likewise?

If not — investigate the many time-saving features of GRAY PLANERS.

Here's the Picture

This 96" x 84" x 22' Gray Heavy Duty Double Housing Planer is planing nut machine frames at the Waterbury Farrel Foundry and Machine Co., Waterbury, Conn.

The G.A. GRAY Company

planers • milling planers
planer type milling machines
horizontal boring machines

CINCINNATI 7, OHIO, U. S. A.

SOLD IN CANADA BY UPTON, BRADEEN AND JAMES, LTD. • SOLD IN LATIN AMERICA BY MACHINE AFFILIATES

Machine Tools

The Office of Price Stabilization has finally given machine-tool builders a set of acceptable price ceilings.

The new price order—Revision 1 to Supplementary Regulation 2 under CPR 30, effective Aug. 27—permits manufacturers to raise prices by an estimated 10%. Specifically, the new order provides:

(1) A flat increase of 12% in the pre-Korean base-period price.

(2) Addition to the new base-period price of all labor and material cost increases up to next Sept. 10.

(3) A mandatory effective date of Oct. 15—though producers were permitted to begin pricing Aug. 27. Form 8's, listing cost data and the new ceilings, must be filed with OPS before the new prices can be charged.

(4) A 21% return on assets for new firms just entering the field.

• • •

Previous machine-tool regulations are not cancelled by the new order; it merely provides producers with an optional—and generally profitable—alternative. In most cases, Revision 1 will mean even higher ceilings than the Capehart Amendment to the new controls act would permit.

Additionally, the new order will simplify paper work: In figuring subcontracting costs, either actual past experience or future estimates may be used. If the estimate proves to be too high, the prime contractor has four months in which to make refunds to his customers.

• • •

Defense mobilizers are confident that the increases permitted under the new order will break the last bottleneck to production of the badly needed tools.

However, while the trend will be upward, machine-tool production won't be doubled overnight.

Pricing isn't the only problem. Financing must be obtained for plant expansion to push machine-tool output. And, like so many other industries, the industry has its manpower troubles.

• • •

Local draft boards are being alerted to keep at a minimum the induction of skilled machine operators.

If either Selective Service or reserve callups threaten production schedules, machine tool builders are urged to go direct to Air Force district procurement offices for help.

• • •

Washington is refusing to place pool orders for machine tools to be delivered later than the third quarter of 1952. Builders feel however that as the time limit approaches, the government will extend the period of grace until the end of 1952.

Of $165 million at hand for pool orders, only $54 million thus far has been placed and accepted.

Many machine tool builders still say that they see no advantage in taking on a pool order. On the other hand, one company with a sizable pool contract has filled 75% of the orders called for and is in process of negotiating a new pool contract.

• • •

New orders for machine tools in August should exceed the NMTBA index figure of 496.6 for July. The revised June index stood at 558.8.

Shipments in July were down to 144.7, preliminary index figures show, from 182.8 for revised June shipments. Vacation time was a factor in the decrease.

• • •

British are keenly interested in getting delivery on time of about 2900 machine tools (out of 7500 ordered in the U.S.) for the Rolls-Royce Avon engine program. Washington is pushing London to step up output of the Sabre jet fighter, which is powered by the Avon engine.

Feeling in London is that these machines will be delivered to England pretty much on schedule. But they still will come out of the 30% of U.S. production after the armed services have taken their 70%.

• • •

And that brings up the point that some machine tool builders feel that allocations to various branches of the armed services under M-41 are not realistic. These allocations are the work of representatives of the Joint Chiefs of Staff.

Confusion is being created in subcontractors' plants by unscheduled arrival of new machine tools ordered for the subcontractor (without his knowledge) by the prime contractor. Some of them come from the prime contractor's pool.

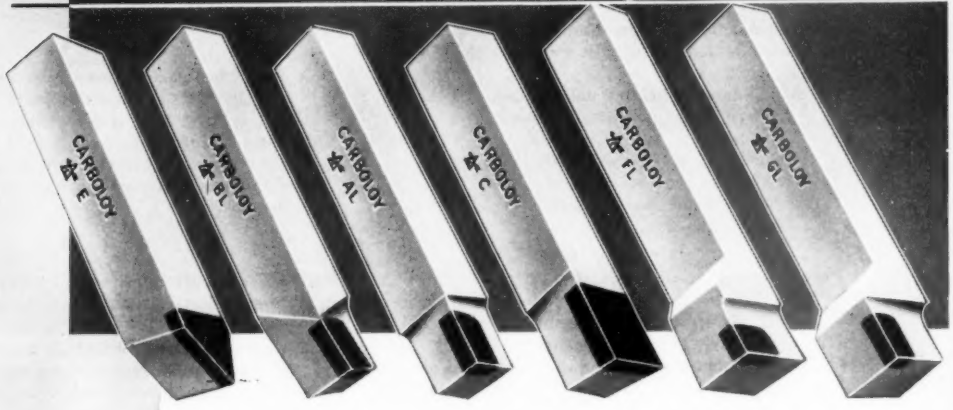
Example: One midwest aircraft parts company received six grinders unexpectedly. Other machines to go on the same production job had not arrived, so the grinders were pushed to one side for an indefinite time.

Several machine tool builders say that they are shipping machines to subcontractors at direction of prime contractors they never heard of before.

Some machine tool builders with certificates of necessity to expand production have not been able to get structural steel to erect more plant facilities. Air Force has promised, in at least one case, to provide the steel.

Boost Production

with Standard Carboloy Tools...



with Carboloy Services... *finer*

An all-inclusive service program . . . to help you get the greatest possible benefit of performance and savings from Carboloy Cemented Carbides. Covers everything! Tool design . . . all phases of use, maintenance of carbide tools . . . practical tips on tool conservation, increased productivity.

Specific services and material include advice and assistance from skilled Carboloy engineers and technicians. A Customer Training School in Detroit for your key men (tuition-free). Slide Films (at approximate print cost) for your in-plant use. Technical Literature. Catalogs. Manuals. Charts. Everything you need to help select, design, fabricate, use and maintain carbide tools. New technical training literature for defense production, too.

Also, to increase the all-around efficiency of carbides in your plant, the Carboloy Plan of Coordinated Carbide Control . . . the famous "Triple C" Plan adopted and proved by hundreds of manufacturers.

Write, wire or phone Carboloy organization today for information about this outstanding Carboloy Service Program. Or contact your local Carboloy Sales Engineer or Authorized Distributor.

Specify **CARBOLOY®**

CEMENTED CARBIDE

Lower Costs...

fewer tools to do more jobs

No need to stock a heavy, costly inventory of special carbide tools... not when you use Standard Carboloy Tools. Only 11 styles are needed to do 4 out of 5 of your single-point tool machining applications. Whatever the job, whatever the material, chances are that one of these versatile Standard Carboloy Tools is adaptable.

Standard Carboloy Tools cost less than many high-speed steel tools, too, outlast them as much as 10 to 1. Wherever they're used, production goes up, tool costs go down. And savings in tool maintenance, down-time and tool replacement really add up.

Over 14 million of these *uniform* high-quality Standard Carboloy Tools have been setting records throughout industry. Doing tough production jobs faster, better, cheaper.

Standard Carboloy Tools in the most commonly used sizes are available from your local authorized Carboloy distributor. The Carboloy organization is the world's oldest and largest producer of cemented carbides.

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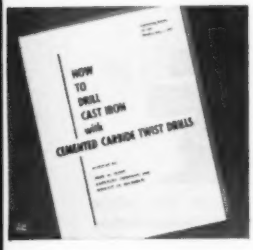
aids to extra performance



FOUR IN-PLANT CARBIDE AIDS. Part of the comprehensive Carboloy Service Program (left) to help you to new highs in production and savings through most effective use of cemented carbides. Program, illustrated above, left to right, includes: (1) Technical data on how to drill Cast Iron with Carbide Twist Drills, (2) Famous Carboloy "Triple C" Plan, (3) Cemented Carbide Data for Defense Production, for shell contractors only, and (4) Slide Films for training in carbides. All services free, with exception of slide films, which are yours at approximate print cost. Write today.

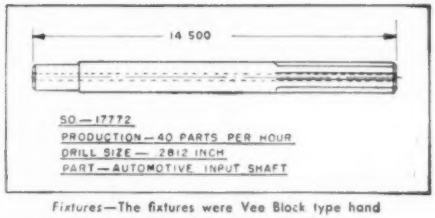
STANDARD TOOLS
THE QUALITY BRAND

ARE YOU HAVING HOLE TROUBLE TOO?

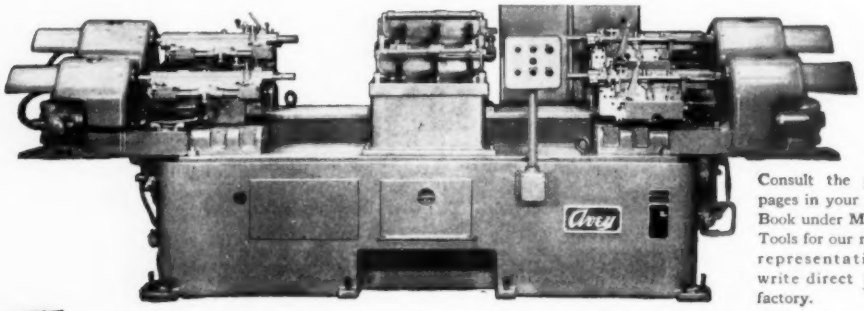
LET Avey ENGINEERS SOLVE YOUR PROBLEM!

HORIZONTAL DEEP HOLE DRILLING MACHINE

S. O. No. 17772 — Consists of four No. 1 *Avey-draulic* (hydraulic) Deep Hole Drilling Units mounted horizontally on a well-ribbed fabricated steel base. The Units having 12" ram travel were arranged in pairs to drill a $\frac{7}{32}$" diameter hole 14½" deep from both ends. An electrical interlock was provided to prevent drill interference. The coolant system and hydraulic power source were incorporated in the base. Machine as illustrated conformed to Automotive Standards. Write for literature.



Fixtures—The fixtures were Vee Block type hand clamping to accommodate one part each.
Material—8641 Steel.

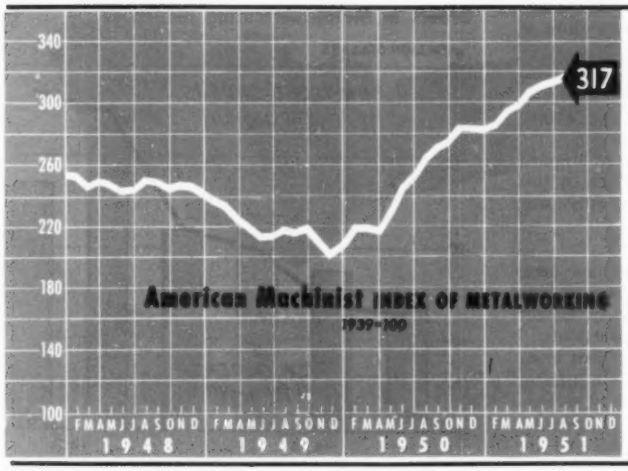


Consult the yellow pages in your Phone Book under Machine Tools for our nearest representative or write direct to the factory.

Avey DRILLING MACHINE CO.

CINCINNATI 1, OHIO

Gaging Metalworking


340
300
260
220
180
140
100
317
American Machinist INDEX OF METALWORKING
1939=100
F M A M J J A S O N D F M A M J J A S O N D F M A M J J A S O N D F M A M J J A S O N D
1948
1949
1950
1951

INDEX

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	AUG '51	JULY '51(p)	JUNE '51(r)	JULY '50
	317*	314	310	266
Machinery	315	304		244
Electrical Manufacturing	344	351		303
Automobiles, Trucks	228	235		256
Transportation Equipment	438	389		250
Other Metalworking	322	323		286

* Estimated (p) Preliminary (r) Revised

No Summer Slack in Metalworking Output

The Metalworking Index continues to rise through the summer months. The index of Other Transportation Equipment (aircraft, railroad and freight cars, and shipbuilding) gains in leaps and bounds.

July output in this group was 75% higher than last July. As defense expenditures rise to a monthly rate of $4 billion, this group will be relatively more and more important in the total metalworking index.

• • •

The Durable Manufactures index of FRB, however, declined in July to the lowest level in the last eight months. But this should be the lowpoint. Production is expected to rise gradually, with new peaks attained each month from now through early 1953.

• • •

Almost half of the defense effort is accounted for, regionally, by middle Atlantic and east north central states together. Dispersion of industry from these areas is now of prime importance.

But new orders and new plants continue to be concentrated in these same areas. This indicates a tightening manpower situation there in the near future.

Power output in the last weeks of August was at an all-time high, indicating an ending of plant vacation shutdowns and the beginning of the new upswing for industrial production.

Electric appliance output continues to fall off. Production could be higher, but retail sales are poor. Easing of credit restrictions hasn't been the answer. Lower prices would give the industry a shot in the arm.

Construction machinery producers are getting about 82% of their metal needs in the third quarter. Allotments in the fourth quarter are expected to be even higher.

Farm machinery producers, on the other hand, are not getting enough metal allocated. With farm incomes up more than 15% and crops expected to be better than last year, demand will be very high for farm machinery.

Industrial building goes on at a rapid pace. Over $9 billion worth of tax amortization certificates for new and expanded facilities has been approved by DPA. Earlier estimates of capital expenditures for 1951 have been upped and now are being revised upwards again.

• • •

Stamping industry shipments in July lagged far behind June, while new orders received in July exceeded those in June by a wide margin.

Figures compiled from a small list of members of Pressed Metals Institute revealed their shipments to the automotive industry in July were 23% less than in June, their shipments to the military in July were off 14% from June and all others were off 40%.

Gaging Business

Employment hit the highest July level on record—62.5 million. Number of women in non-agricultural jobs reached the level prevailing at peak of World War II.

Factory employment of 15.8 million in July was down by 100,000 from the June level. Minor employment declines were listed for almost every industry.

In the durable goods industries, employment dropped off 166,000 from June. Only industry in this group which showed a gain in July was ordnance and accessories.

• • •

A number of tool and die manufacturers have been forced to turn down contracts because of lack of necessary equipment, or inability to get reasonable delivery on new machine tools.

That's true especially of shops having orders from prime contractors to produce dies for turning out stampings for aircraft engines that heretofore have been cast or built up by weldments.

Big stumbling block has been that the tool and die makers must have the same type equipment to turn out dies as engine builders need. To fill some subcontracts in the time specified would require two and three times present equipment of shop owners.

• • •

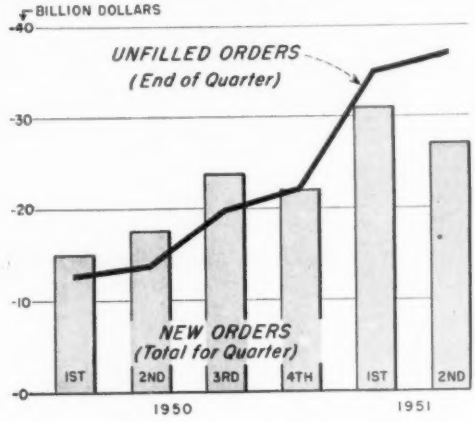
Backlog of drop forgers has been increasing steadily through this year. Now it stands at about six months. No let-up in volume of new orders has been noted in any month of 1951.

More than 80% of the industry's output is now going to some phase of national defense.

• • •

Steel users who have been depending on free steel marketed through warehouses are being notified by warehouse owners that none will be available after the third quarter.

Backlog Mounts Up Faster Than New Orders in Metal-fabricating Industries



CMP will have taken over complete allocation of steel casters' products by fourth quarter. Production of the industry now is about 90% direct military or for defense-supporting industries.

• • •

Production capacity is becoming available in a number of malleable-iron foundries as automobile and truck builders cut back on orders.

Malleable founders so far have felt only slight effects of defense orders. Some industry members forecast another three or four months of unused capacity before sufficient defense orders trickle down to casters for their particular grade of iron.

WEEKLY BUSINESS INDICATORS

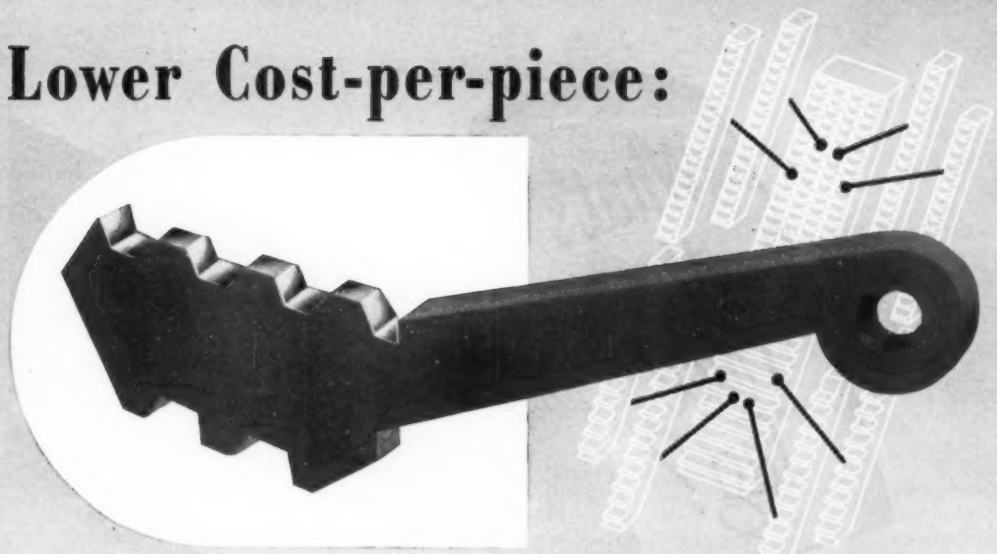
	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1923-1925 = 100)*	231.0	230.7	221.4
Steel ingot production (thousands of tons)	2,007	2,029	1,747
Electric power output (million kilowatt hours)	7,164	7,070	6,370
Production of automobiles and trucks	129,541	97,352	190,879
Engineering construction awards (*Engineering News Record*, millions)	$188.9	$214.9	$198.8

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Index of industrial production (1935-1939 = 100)*	215	222	126
Index of durable manufactures production (1935-1939 = 100)*	267	276	235
Durable goods manufacturers' sales, millions*	$10,814	$11,077	$9,030
Electrical machinery manufacturers' sales, millions*	$1,188	$1,246	$955
Other machinery manufacturers' sales, millions*	$1,972	$2,004	$1,385
Durable goods manufacturers' new orders, millions	$12,304	$11,773	$9,814
Electrical machinery manufacturers' new orders, millions	$1,410	$1,560	$1,035
General machinery manufacturers' new orders, millions	$2,470	$2,434	$1,527

* Seasonally adjusted.

Lower Cost-per-piece:



BROACH REDESIGN *cuts tool costs* $530.00 *saves on maintenance, too!*

The original tooling to produce the forms on the above part incorporated each contour in a solid broach. Detroit Broach engineers recommended "breaking up" each form into individual inserts as well as rough and finish sections. The result was an immediate saving of $530.00 per set of tools. While the rate of production remained the same, the smaller size and simplified form of each insert made tool sharpening costs drop substantially. Further, if some part of the form was damaged, only one insert, either "rougher" or "finisher"—not an entire form broach—needed replacement.

These are typical savings that can be had when broaching tools are studied by qualified specialists with an eye toward production efficiency . . . toward lowest cost-per-piece. Detroit Broach engineers *are* such qualified experts since they work with the design and manufacture of broaches and broaching tools exclusively. Whether your problem is a new broaching application or boosted efficiency from a present broaching job, why not get Detroit Broach to look in?

DETROIT BROACH CAN CUT YOUR COST-PER-PIECE

by

1 Developing broaching set-ups to replace other, more costly machining methods.

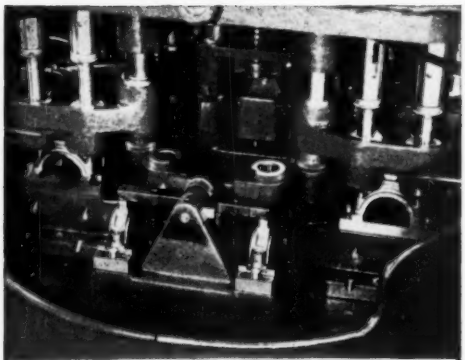
2 Redesign present broaches and broaching set-ups to make them more efficient.

WORLD'S LARGEST MANUFACTURER OF BROACHES AND BROACHING TOOLS EXCLUSIVELY

DETROIT BROACH COMPANY

20201 SHERWOOD AVE. • DETROIT 34, MICH.

The Buyer Gets a Better Value ...with an assist by MORRIS PRECISION PRODUCTION



Hand-clamped in pairs, forged steel (SAE 1041) connecting rod caps are rough spot faced, finished spot faced and countersunk (a total of twelve operations on the two parts) at a rate of one part every 8 seconds!

Automotive Connecting Rod Cap—Two Views.

In the auto plant or in the showroom . . . it's an American trait to want quality at a price. The manufacturer gets it in a MORRIS Production Machine . . . for a better product at less cost . . . and passes it on to the buyer in a mass produced car.

MORRIS Production Machines cut time and costs wherever multiple drilling, reaming, tapping, boring or similar operations are performed. In addition, a major plus feature is offered, namely, all machines are built from *standard units* to do a *special job* . . . a real savings in initial costs.

Just mention your specific problem. Chances are, in our forty years, we've handled a similar problem and can show you cost-saving facts and figures.

Builders of MOR-SPEED Line

THE MORRIS MACHINE TOOL COMPANY

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"A better product at less cost — with PRODUCTION plus PRECISION"

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Ask the British

It's a good thing now and then to see ourselves as others see us.

The British have been giving us this opportunity the past few years by sending over teams of specialists who study our production methods and then report their findings back home.

There has been a parade of such teams. Remarkably enough, each one has returned to England with pretty much the same story, despite the fact that each has arrived at its own conclusions independently of other teams and that each has explored a different segment of American industry.

Conclusions reached recently by a 15-man team from the British valve industry are typical of what other teams have reported. The team consisted, as all of them have, of machine operators and foremen as well as of managing directors and engineers.

GETTING AT the heart of the matter, the team observed, "If we all want more goods (and most of us do) the only way we can get them is by producing more." Then the team proceeded to put the same thought in slightly different language, "The only practical way by which the general living standard of all can be raised is by producing more goods per manhour worked."

The men from the country in which socialism abounds made this cogent comment, "Every worker (in the United States) is well aware that a company which cannot make regular profits is providing him with an insecure job. He may easily lose it if the company does not make profits and does not use a substantial part for modernization. This is a very practical viewpoint which is sometimes ignored in the United Kingdom."

Higher output per manhour in this country is not achieved by harder physical work, the team pointed out. It is the outcome of greater mechanization, better use of machines, specialization, standardization, and simplification of products. It is quite the usual thing for a man to operate two or more machines and not be overworked.

The team expressed the view, after its American study, that any work-saving device should be looked upon as an asset and not as a potential threat to regular employment.

HERE THEN, in a few well-chosen words, the British have made clear to their own people why our industrial system works so well for both management and employees. They have explained why our factories are efficient, our costs low, our morale high, our purchasing power unmatched elsewhere.

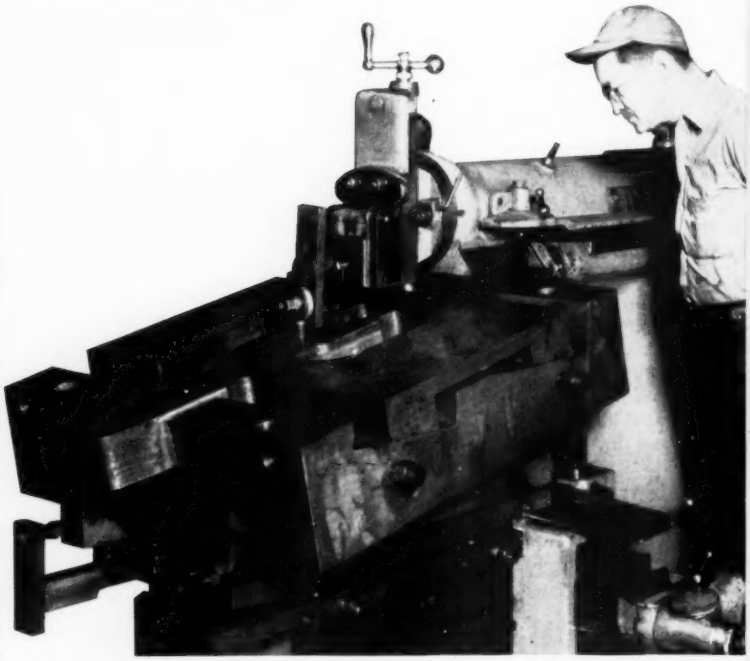
Their analysis is an effective answer from an unprejudiced source to those here at home who put little faith in our economic system and who want to discard it.

Our system isn't perfect. It can stand a lot of improvement. But we never should forget that it is providing us with the highest standard of living anywhere. If you are in doubt, ask the British. They have found out at first hand.

Burnham Finney

Cincinnati Shapers are

versatile money savers...

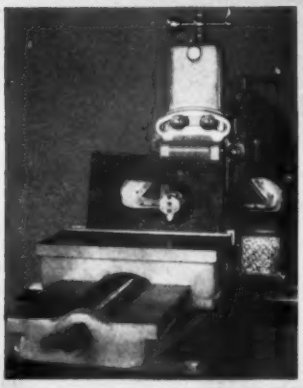


Eight to ten hours' work cut to fifteen minutes in this unusual application of a versatile Cincinnati Shaper.

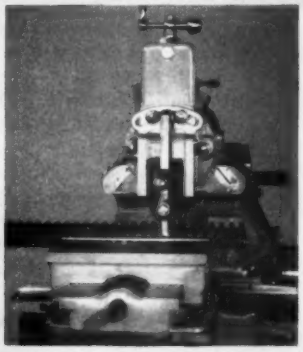
Hand scraping the mating surfaces of press bed bolsters required eight to ten hours. On this Cincinnati Shaper the lapping operation replacing the hand scraping method takes only fifteen minutes.

Versatile Cincinnati Shapers, with low tooling and set-up costs, bring to your shop a money-saving "handy man."

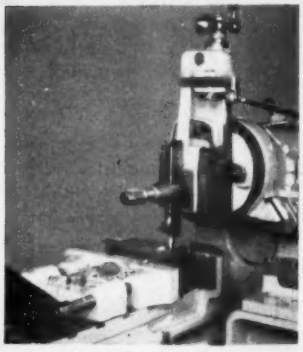
Write for Catalog N-5, illustrating the complete line of powerful, accurate and versatile Cincinnati Shapers. You will find just the size and type for your shop.



1. Internal Shaping
Many irregular shapes are cut with a simple extension tool.



2. Maintenance and Repair
The unusual versatility of a shaper is invaluable for this work.



3. Contouring
A great variety of shapes are automatically machined with tracer control.

THE CINCINNATI SHAPER CO.
CINCINNATI 25, OHIO U.S.A.
SHAPERS · SHEARS · BRAKES

Precision

BUILDS POWER ON WHEELS

BY E. J. TANGERMAN, EXECUTIVE EDITOR AND CHARLES EMERSON, ASSISTANT EDITOR

Combining their particular skills and backgrounds, American Locomotive Company, Schenectady, N. Y., and General Electric Co., at its Erie, Pa., plant, are building diesel-electric locomotives, Alco producing the engine and frame, GE the generator, motors, and electrical controls. As a result of our presentation of GE turbojet manufacture (*AM*, Feb. 5), American Machinist editors have been permitted to study production facilities in both plants and to select from thousands of operations those which are most unusual and broadly applicable. These are presented here as a double-length Special Report, in the picture-caption form we pioneered for your easier study. While pictures appear roughly in sequence, only exceptional operations are shown and described. Most of the photographs were taken by Jim Burns.

A SPECIAL American Machinist REPORT TO THE METALWORKING INDUSTRIES

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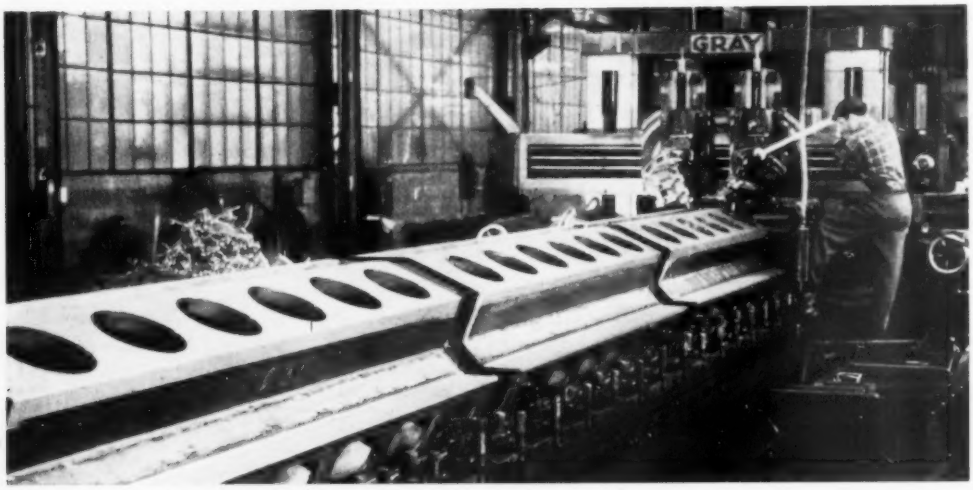
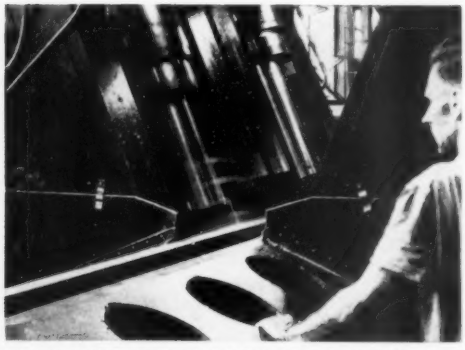
THE PRIME MOVER IS A POWERFUL DIESEL

FRAME AND BASE ARE COMPLEX WELDMENTS

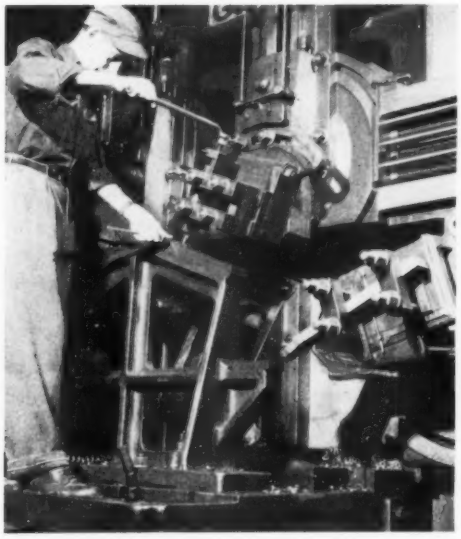


Four diesel blocks are machined on top decks and camshaft shelves at once on a Gray planer with 40-ft table. Setup is special in that crossrail-head feedscrews are synchronized to feed horizontally and vertically, simultaneously. Thus top-deck surfaces are completed at 22½° angle, while the side heads feed horizontally on the camshaft shelves. Combined feed on the crossrail gives an angle which repeats within 0.002 in. Head clapper boxes carry tools at

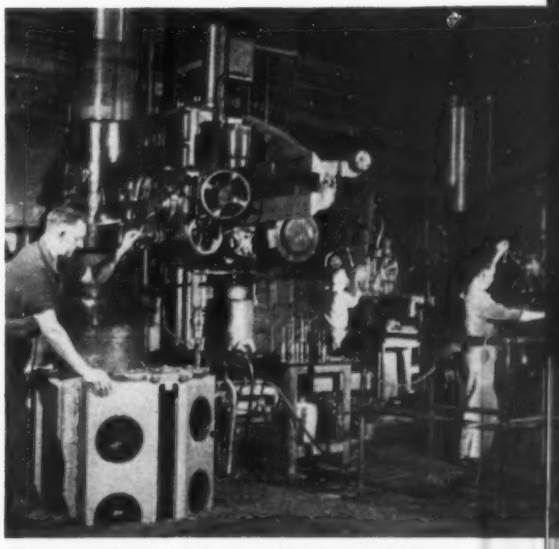
◀ **Cylinder blocks** are bored for liner fits and faced in a special 4-spindle Ingersoll special-purpose boring machine. Two heads handle roughing and two handle finishing, and opposite holes can be worked at once. Heads bore within 0.0015 in. for tolerance and repeat within 0.002 in. end to end under automatic control and positioning. Dial indicators with stops prove head location



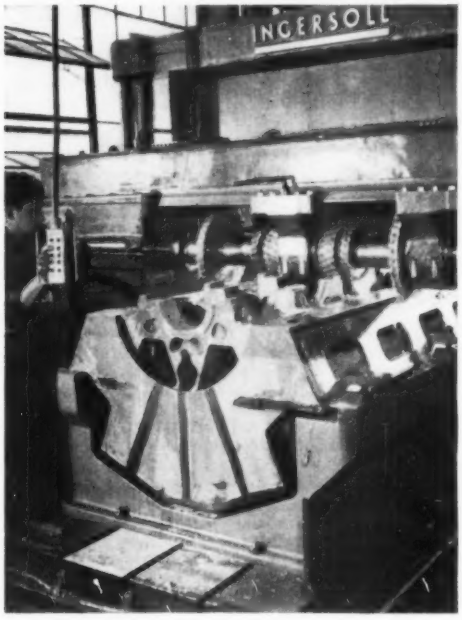
Four tools 90° apart are located on each roughing head (foreground), two doing rough boring and two sizing. Four individual tools higher on the bar do second roughing. Finishing heads (background) carry two single tools and two on a block. The single tools do finish-boring; the other two do chamfering and facing



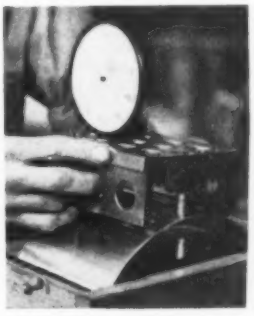
edges rather than centered; thus the two tools can be brought close enough together to start the cut. Both feed outward. Toolbits can be adjusted by screw in the box-holder; are set to a master gage bolted to the table end



End holes in frame and base are drilled, tapped, counterbored, etc (after boring as shown on the next page), on radial drills with the piece set in a pit and surrounded by fitted gratings. In the railed enclosure between machines is a ladder leading into the pit. The piece is locked below by side air clamps, and a drill plate located on top. The base is drilled by a Carlton 5-ft x 17-in.-column unit, the frame by a Carlton 6-ft x 19-in.-column unit. Another 6-ft Carlton and a 6-ft. Cincinnati-Bickford in rear handle other drilling operations. Each is on a car moving on rails, clampable at any point on the track by a magnetic unit

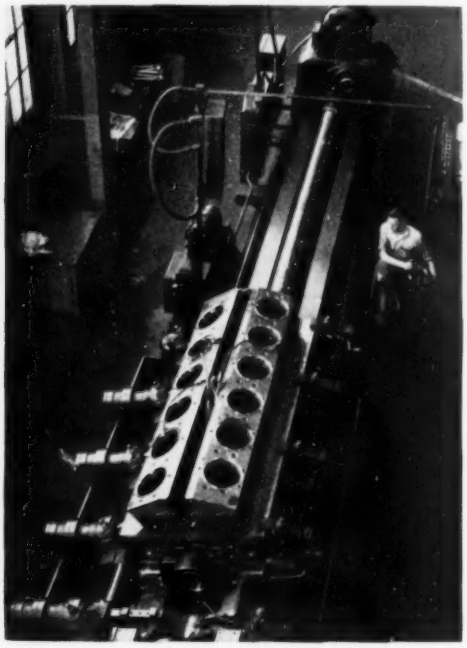


Tools for the boring mill (bottom of next page) are set to a master bar gage. The gage is the diameter of the boring bar, with pins set to exact tool heights. The indicator saddle carries a dial indicator which can be set to the proper pin, then used to check the tool. Single tools can be moved out by an adjustment screw behind them and through the bar, then locked by setscrew

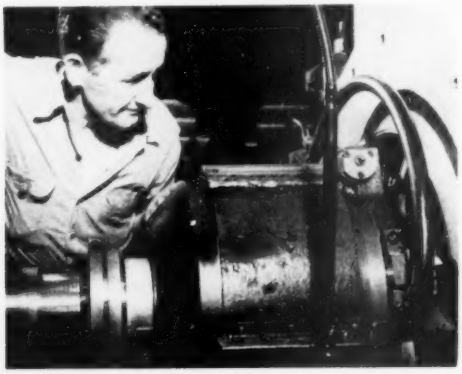


◀ **Alignment** of the main bearing caps, when the frame is ultimately assembled to a base, is insured by eight carefully machined surfaces. These are roughed on a planer, then the frame is inverted in a bathtub fixture on this Ingersoll slab miller, the eight surfaces being finished by six cutters simultaneously to tolerances of 0.001 in. in some cases, 0.002 in. in others. Only subsequent finishing is scraping

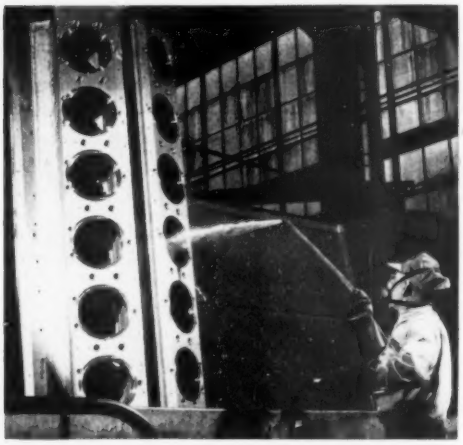
MULTIPLE TOOLING MACHINES ENGINE FRAME



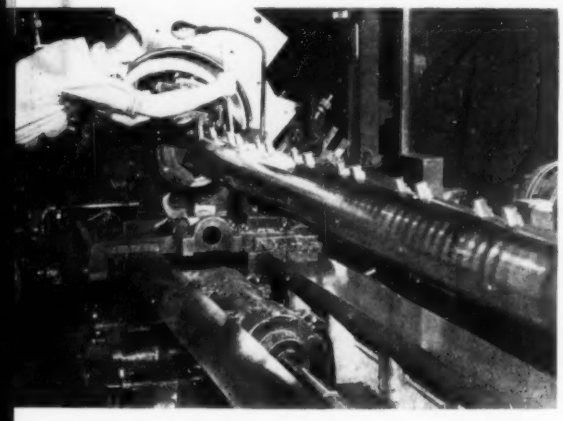
Crankshaft seatings in the welded-steel frame and forged-steel caps are machined in a special W. F. & John Barnes boring mill in which are 25 tools. The frame is set and clamped at a slight angle in one end of the machine, with boring-bar guide bushings between bearings. (A 12-cylinder block is shown in place, with guides for two more cylinders visible at the near end.) Each bushing has a slot, and the fixture has a slide (operated by hydraulic cylinders at left) with which the workpiece can be moved off-center $\frac{3}{4}$ in. to match the slots so the boring bar can be passed through with tools in place (photo below)



Final machining on this unit is facing the generator-flange mounting surface. Three tools (one rough, one finish, and one chamfering) on a disk holder, through which the boring bar passes, are separately driven by a hydraulic drive. Here operator checks generator fit as finishing tool engages. Chamfering tool, which engages after 13/16-in. cut, is shown in foreground

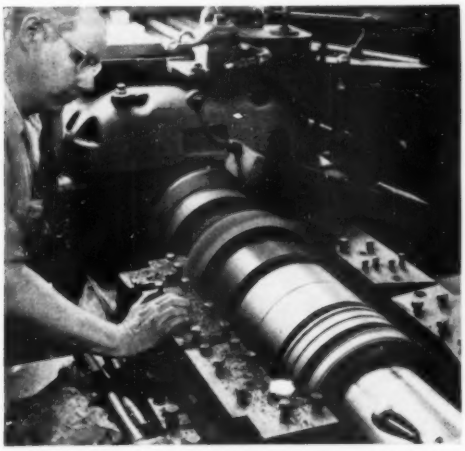


Frames and bases, after machining, are cleaned in a large tank, about 4 x 10 ft by 8 ft deep, set at half its depth into the ground. A hinged top prevents evaporation of the solvent and provides a splashboard during cleaning. The piece is picked up by crane and lowered into the tank. Then the masked operator washes it down with a jet pipe, pumping the solvent (perchlorethylene) from the tank



Boring bar carries 20 tools: 9 roughers, 9 finishers and 2 facing tools. Roughers and finishers are in tandem, so the 9 bearings are first roughed, then finished. (Operator is checking finishing-tool height.) As finishers complete their cut, a pair of facing tools in the bar are in position to machine the thrust surface on the end bearing. These are fed outward by telescoping of the boring bar, which feeds the toolblock outward by pushing a slot on a wedge

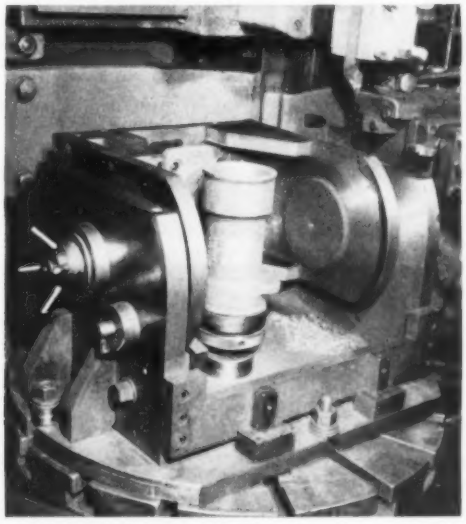
PISTON AND LINER ARE COMPLEX



Cast-iron cylinder liners are turned in a 16-in. Lodge & Shipley Duomatic 3A with a total of 11 tools, 5 in front slide and 6 in the rear. In effect, the front slide does rough-turning to size, the rear slide finish-sizing and grooving, chamfering, etc

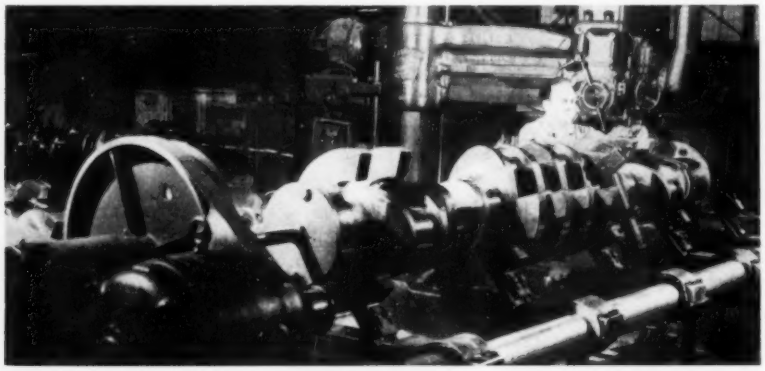
Pistons are 2-part assemblies of aluminum forgings. The skirt forging is turned complete with grooves, and the ring carrier turned separately. Then the rings are heated to 400° F in an oven, placed in a Logan press, and shrink-fitted over the skirts in groups of six

Piston is welded around the top in an automatic welder with an inert-arc head, the piston being rotated automatically under the welding head. Ring on top is a gas-conserving device, and there is a protective shield around the outside of the ring. Protective cap is on top of ring-and-skirt assembly. Evacuator cone at top removes fumes. Operator looks through protective glass shield

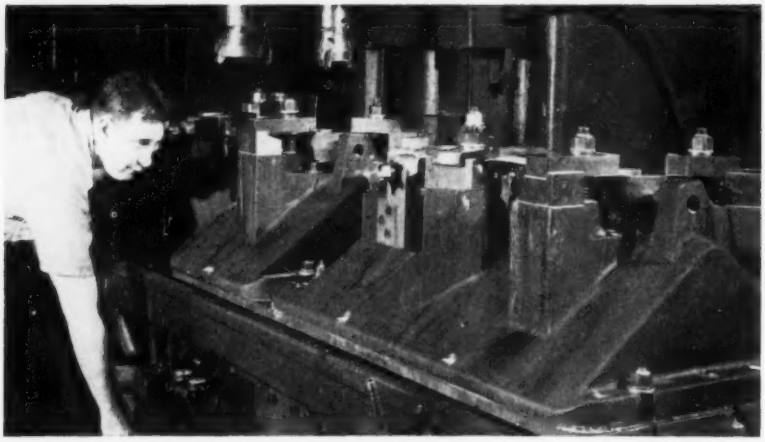


Exhaust-manifold castings for the 16-cyl diesel must be bored and faced on both ends of the crossbar of the T, the bores to be accurate within 0.002 in. for diameter and 0.005 in. for alignment. Center shoulders make through-boring impossible, so the job is done from both ends. The foot is bolted into a flop-over fixture and the crossarm supported from below by a pad. When one side is bored in a Bullard VTL, the pad is released, the fixture top flopped over 180°, the pad tightened, and boring resumed

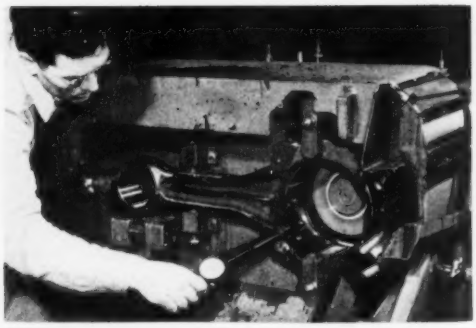
CRANK AND CONNECTING RODS ARE BIG, BUT EXACT



Crankshafts are received machined in one corner of the assembly shop. They must, however, be dynamically balanced at operating speed. A Tinius Olsen tester is used, equipped with an electronic head which shows unbalance in in.-oz, angle, and location. Indicated volumes are then drilled out of flanges or counterweights in the Carlton 5-ft x 15-in. radial in the background and the shaft returned to the balancer for recheck. All crankshafts must be balanced within 20 inch-ounces



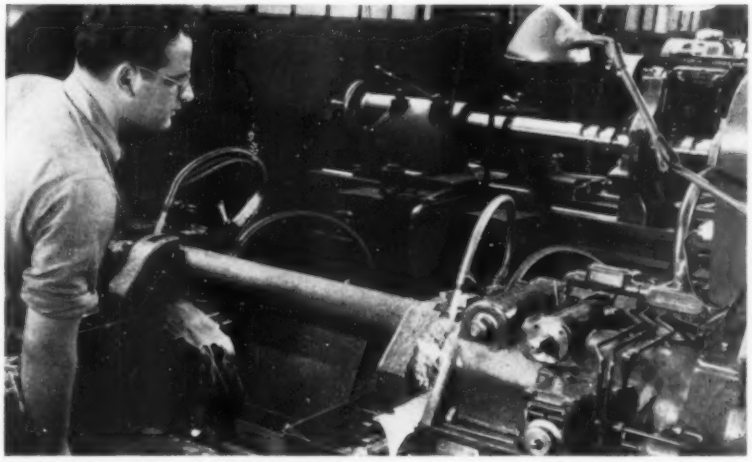
Connecting rods are rough-bored (both holes at once) in a double fixture on a W. F. & John Barnes machine, so one rod can be loaded while another is being bored. Here shields have been removed to show the traversing fixture



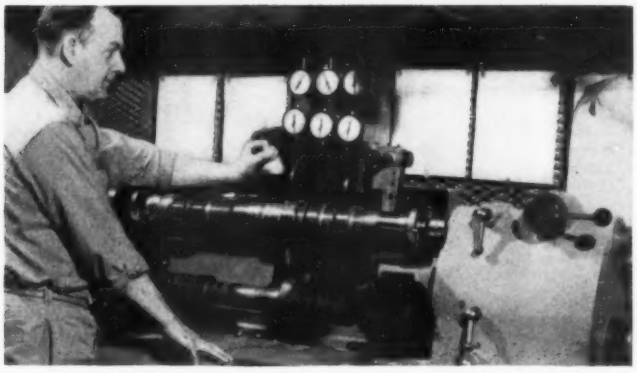
Crank-pin and piston-pin holes in connecting rods are ground simultaneously in a double-spindle Heald internal grinder in which both wheels oscillate within the holes in the clamped work. To prevent scoring from chips or abrasive in recirculated coolant, the machine is equipped with a Barnesdril magnetic cleaner

Finished connecting rods are checked and calibrated on a granite surface plate, which has the advantages of not developing burrs or being distorted by temperature changes

CAMSHAFTS ARE TURNED FROM THE SOLID



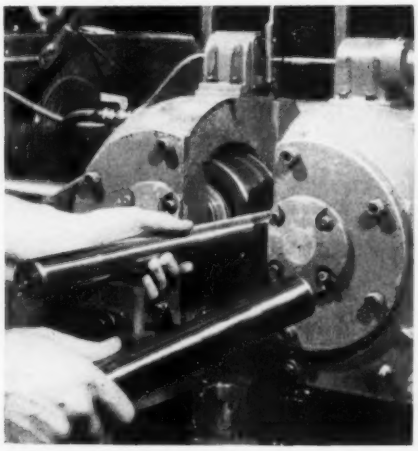
Camshafts, of SAE 1050, are machined from solid bar. After cutoff in groups of three, bars are placed singly in this Fitchburg combination facing and centering machine. It is a double-ended 4-spindle unit, with twin carbide-tipped cutters. The bar, gripped by manually operated clamps, is fed past the first pair of spindles, which facemill it to length; then to the second pair, which feed in to center it



Cams are checked by Sheffield comparator against a master cam. After the first turning operation, the end flange is drilled, and one of these holes (if there are more than one) marked as the locating hole from which all succeeding operations are located. This fixture has straight pins in its twin heads to locate in these holes, both in the shaft being checked and in the master. (The pins also carry flats for periodic checking of angular relationship between master and test piece.) When a test is made, shaft angle is set by a large indexing wheel at left, then the six dial indicators released to bear on three comparable pairs of cam surfaces. Bore, bearing, and pilot are checked with an indicator

Camshaft casings, assembled with caps, have 7 (for 6-cyl) or 9 (for 8-cyl) bearings. These must be within 0.0005 in. for alignment. Rather than through-boring, they are individually bored in this special Snyder machine. It indexes in, feeds the tool through one bearing, backs out, indexes, and traverses to the next bearing position; then repeats the cycle — all automatically. The casing for an 8-cyl unit can be rough-bored and finish-bored complete

NOZZLES AND PUMPS ARE HIGH-PRECISION PARTS

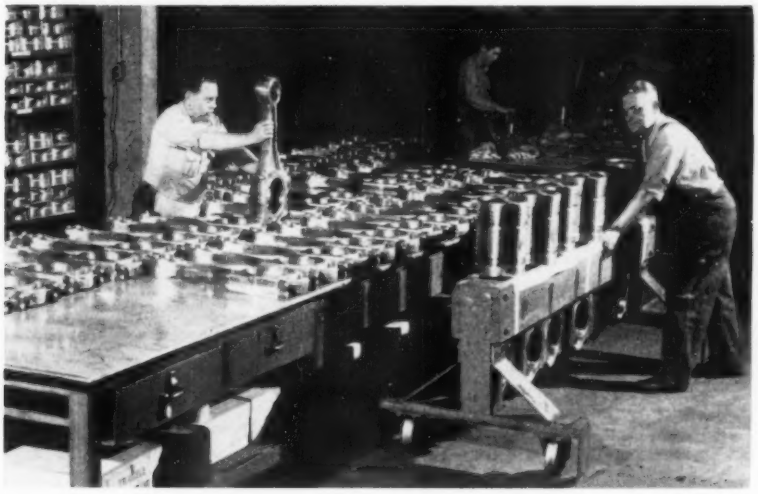


Cylinder-head and other studs and heavy bolts are no longer threaded in the usual way, but are now rolled in this Watson-Flagg machine to class 3 and 5 tolerances

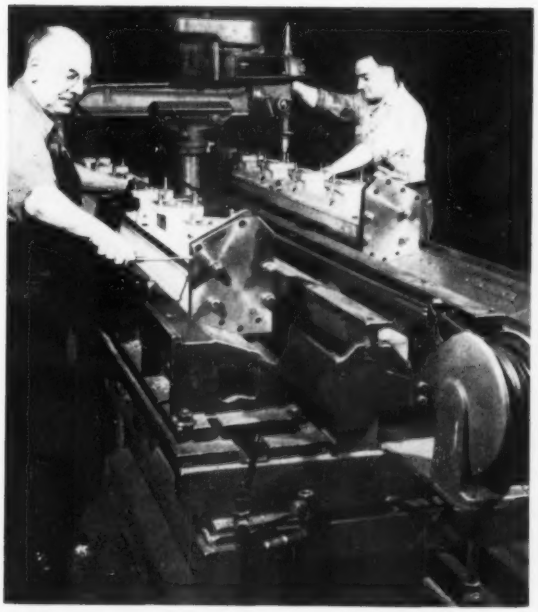
Nozzles and pumps are tested and brought to required tolerances in a controlled-atmosphere room. The nozzle-and-pump assembly is placed in a support which is rigid enough to act as a vise so connections can be made. The oil supply is drawn through a filter and into the hand pump by suction from a tank below the bench. Nozzle tips are removed from nozzle body by spinner wrench, with the body held in the socket at lower center. Jet pulses are trapped in an open tank surrounding the nozzle tip, as the spray pattern is checked

Nozzle needles are lapped in special machines (above white paper on bench top) which rotate the needle roughly 90° at high speed under action of an air-reciprocated rack. Then lapping compound can be applied and the nozzle put over for lapping. A medical tool normally used for checking ears —the otoscope—can be used to examine the inside of the nozzle, and is held when not in use on a rack which also carries a toilet-paper dispenser for wiping parts. Lapped parts are washed and dried under the exhaust hood. An upper nozzle supplies air alone, a lower one a solvent-oil mix

SUBASSEMBLIES COME FROM SIDE LINES



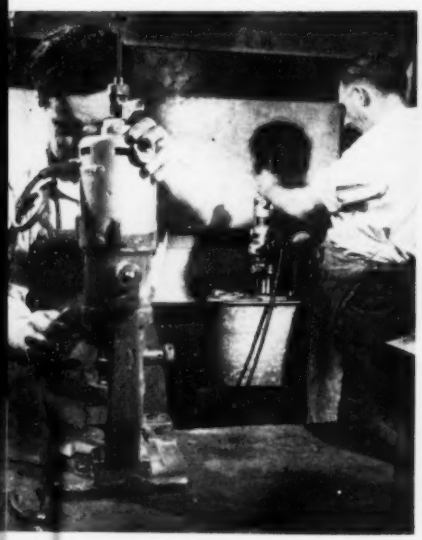
Subassemblies are made in side aisles at right angles to the assembly line. In this way, connecting rods are passed through parallels at the top of the castered dolly onto a portable wooden block. Then the piston is placed over the rod, the pin inserted, and the dolly wheeled to the line so the group can be set into the cylinder block. Benches have aluminum tops to prevent scratching of aluminum parts, and carriers have paper held on surfaces by cellulose tape for the same reason



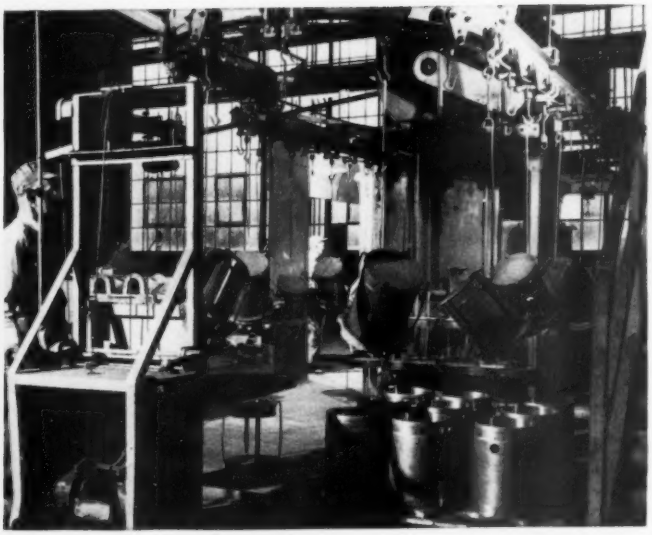
Camshaft casings were formerly assembled on the engine. Now they are put together in a subassembly fixture, essentially a structure of angle iron and channel. A Walker-Turner small radial on a center slide, fed power from a cable on a spring reel, takes care of minor drilling and reaming. Fixture will support casings for both 12- and 16-cylinder engines

Cylinder heads were formerly assembled on a bench, now are assembled on wood pallets on a U-shaped roller conveyor. Assembly begins on a ball conveyor at left, out of picture, then various parts (such as injector and the like) are added along the line. Valve seats are also ground here, as shown in next photo

SUBASSEMBLIES COME FROM SIDE LINES . . . continued

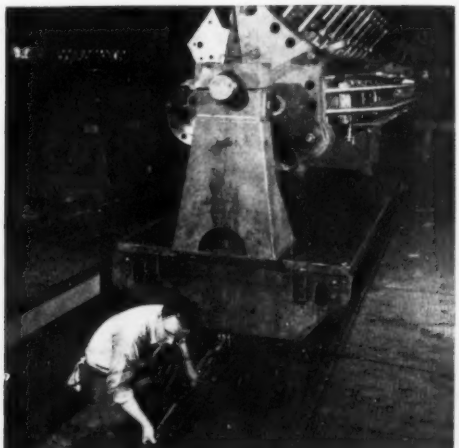


Valve seats are ground by Waterbury-Mall portable electric grinders at two stations (rough and finish) under an exhaust hood. The grinder is supported and guided by special studs. Wheels on the grinders are dressed in a special fixture carrying a diamond on a slide set at proper angle. Wheels are dressed for each set of four valve seats

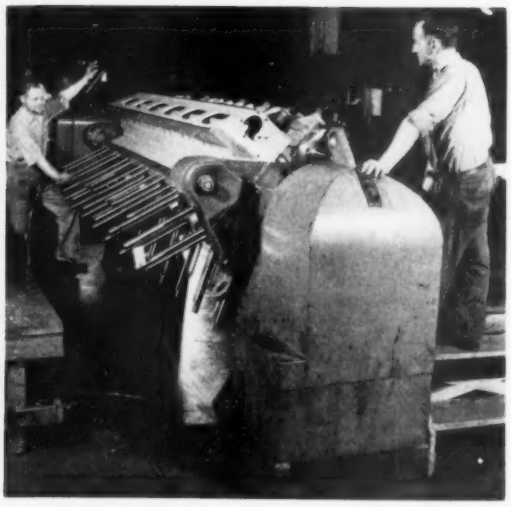


Subassemblies are degreased and painted in a department served by a continuous overhead conveyor. Loads like these cylinder liners are brought in by fork trucks and placed on pallet elevator, which lifts them as needed to conveyor hangers. A water-screen and downdraft paint booth is equipped with two Binks guns

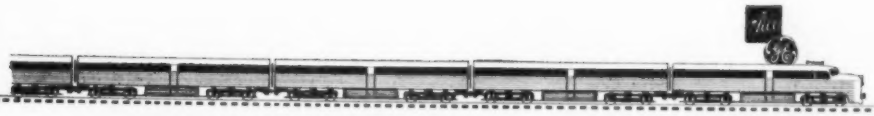
FINAL ASSEMBLY IS DONE ON HEAVY-TRUNNIONED TRUCKS



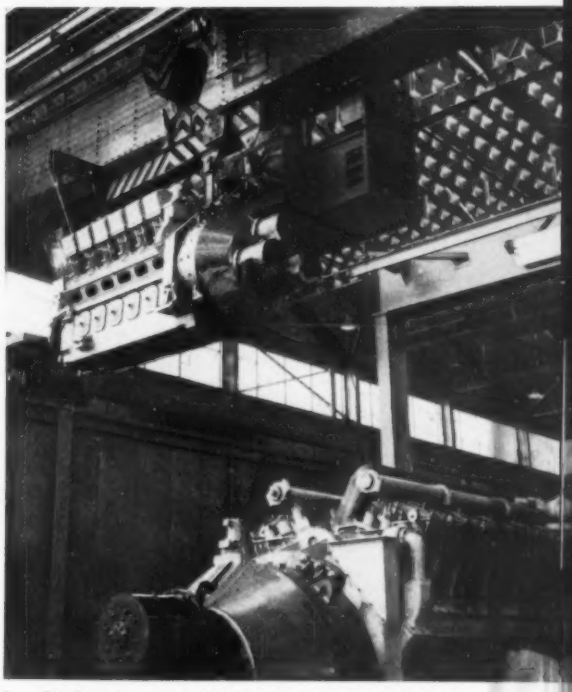
Major assembly is done along a track depressed so surface-plate truck base is level with floor. Engine frames are mounted on fixtures beside head of track, then crane lifts fixture to track end. Fixtures are towed by turnbuckle-fitted hook that joins eye on fixture to eye in conveyor chain under floor. Turnbuckle is adjusted so floor-plate section can be dropped in to ride between fixtures



Powered rollover makes work on engine assembly easy from floor. Power unit at back end of each truck is plugged into current supply at each station to rotate fixture between trunnions, thus bringing up part of assembly to which fittings must be added

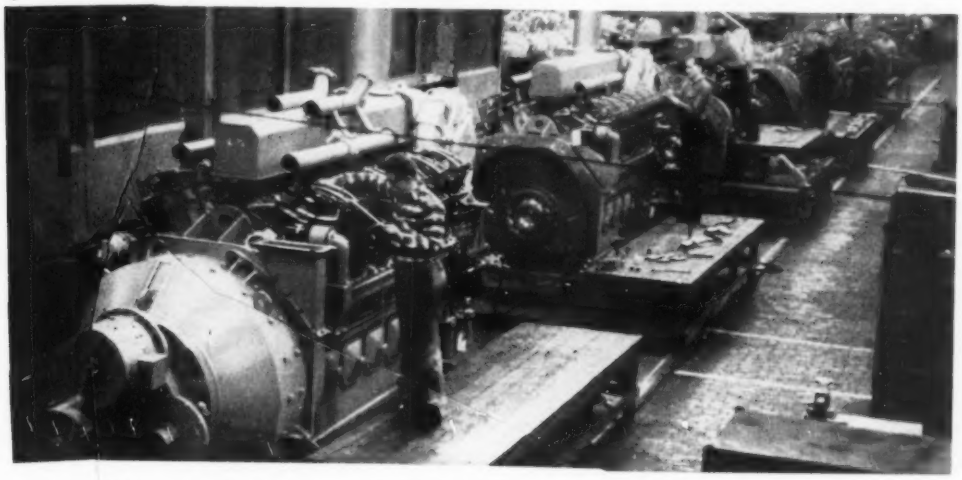


Crankshaft is added and caps are bolted on; then connecting-rod bolts are tightened with socket wrench. Because a torque wrench would not be sufficiently accurate (because of variations in bolt-and-nut fit, for example) nut tightness is checked with a stretch gage. End-to-end stretch of 0.015 to 0.020 in. (minimum stretch caused by 1/6 turn of castle nut is 0.020 in.) is made on 11 3/4-in. bolt



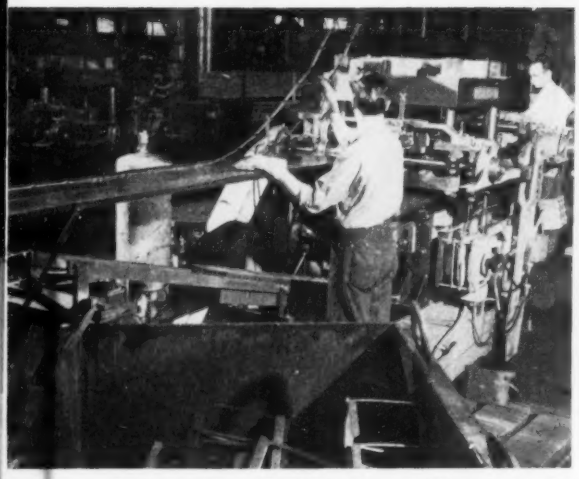
Completed engines are tested in a 6-stand room beside the end of the assembly conveyor. Because walls are only about 14 ft high, engines can be lifted over the top. To reduce noise in the shop, walls are lined with silencing wool behind a steel grid, and unusual paper-cone silencers are hung in groups just beneath the roof

Platforms are necessary at only a few work positions at start and finish ends of assembly line because of sub-floor trucks. Final-assembly stages are served by parts racks set up at right angles to line, making equipment handy



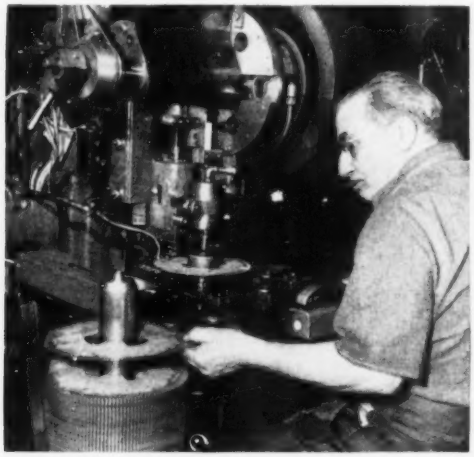
GENERATOR AND MOTORS COME FROM ERIE

LAMINATIONS ARE A QUANTITY JOB

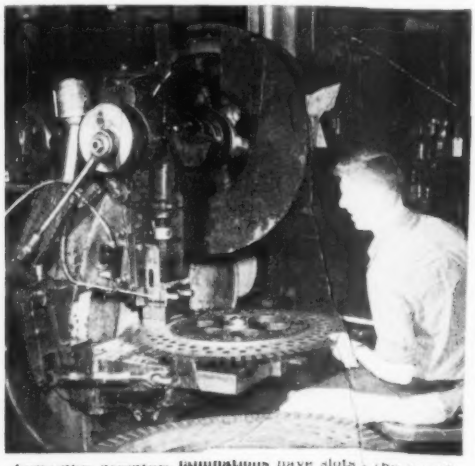


Generator-pole laminations are stamped from 0.062-in. stock by 150-ton Henry & Wright high-speed dieing machine. Scrap runs straight through rollers onto table, while laminations (single one on tote box at right) drop to double-rail carrier that extends under table. Two-stage die punches holes first, then outlines, at 120 per min. Hole slugs drop into pan at far end of press

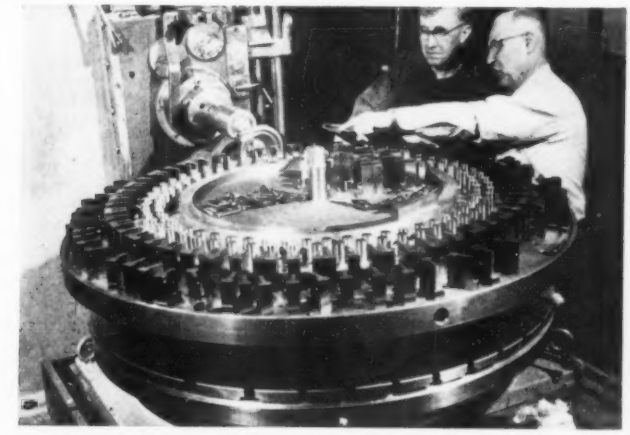
500-ton Danley press runs at 25 strokes per min to stamp out armature-core laminations as fast as operator can feed them. Each sheet has 62 coil slots and 36 air holes (which cool the armature as it runs); takes 310 tons of pressure. Operator picks up blanks at right, inserts first at 0°, second at 90°, third at 180°, fourth at 270°, continuing rotation to average out variations in stock thickness and magnetic properties for the final assembly. Laminations are stacked on mandrel; scrap is tossed over shoulder into skid box. Punchings drop through into a tote box in a sub-floor pit so box can be slid out at press rear on a roller conveyor into hoisting position



High-speed V & O 5-ton presses, remodeled in Erie-Works toolroom, index armature-core laminations for auxiliary generators and punch out slots at 1100-per-min rate. Indexing is mechanical against an air-pressure cushion to prevent over-running. An interlocked cam bar controls the clutch, indexer, and brake. Carbide dies cut 135 slots in each blank, then automatic shutoff stops press for reloading. Blanks are gripped by air clamp

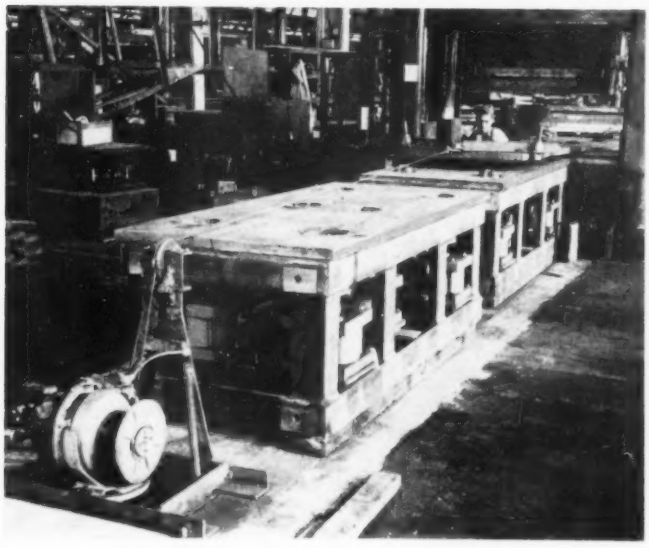


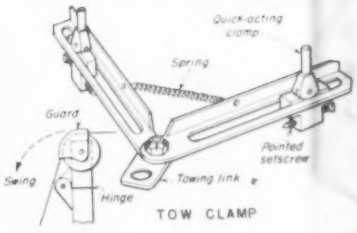
Generator armature laminations have slots in the periphery punched by V & O 15-ton indexing press with carbide punch and die. Dies are reconditioned by grinding off approximately 0.007 in. This press operates completely mechanically with no air cushion. Speed 1400 hits per min on 43-in.-OD blanks. These blanks will be soon finished in one stroke with die recently bu (next page)



GE-designed blanking die for generator-armature laminations being assembled in Erie-Works toolroom. It will punch 135 slots and 114 air holes in 0.019-in. stock. Finished OD is 43 3/4-in. Setup is on Cincinnati-Gilbert universal boring machine with Pratt & Whitney indexing table where alignment of punches is being checked and adjusted with dial indicator attached to machine spindle. Tolerance across die is 0.0005 in.; tolerance between punch and die is 0.0019 in., 10% of stock thickness

Straightening and forming of heavy sections is done on a 1000-ton HPM hydraulic press arranged for 1-man operation. Secret of the efficient operation is centralized pulpit control right at the press, and development of special handling equipment. Tables, about 3 x 8 ft, on each side, are really large surface plates at press-bed level. Each table has six 12-in. pneumatic cylinders built-in and topped with swivelling rollers. Thus, at shop air-line pressure, they can lift about 10 tons. Tables are portable. Air winches at each end (photo below) are interconnected so pieces can be pulled either way. Motor-frame barrels can be formed by multiple strokes on this unit

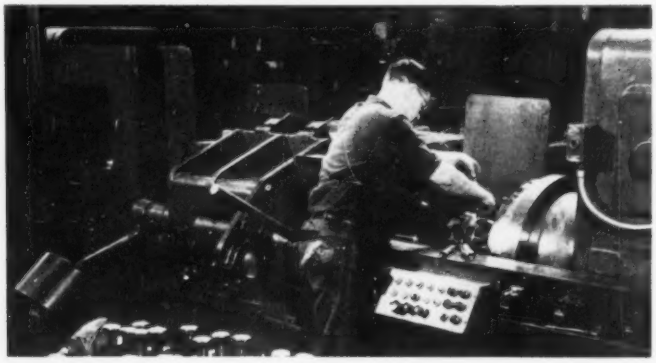


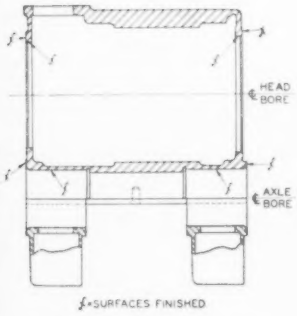


SAFETY SHEAVE

A towing winch at each end of dual press-table, can be moved to end of first table if outer table is not required. Winch frame is located by buttons set in holes in steel plate flush with concrete floor on which tables are also positioned. Cable passes through sheave in hinged head, a protective feature (sketch), so if cable breaks or clamp slips, head will snap back and winch will not be damaged. Winches are interlocked so piece can be pulled either way, with yoke valves at operating pulpit. Clamp is a hinged V of angle iron, with adjustable dogs in slots on each arm (sketch)

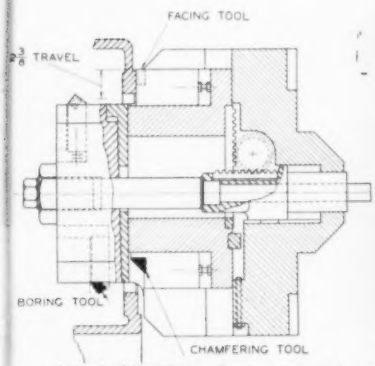
MOTOR FRAMES ARE GANG-BORED

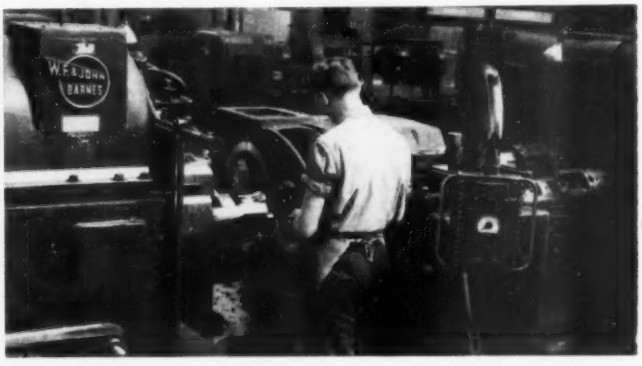




SECTION THRU MAGNET FRAME

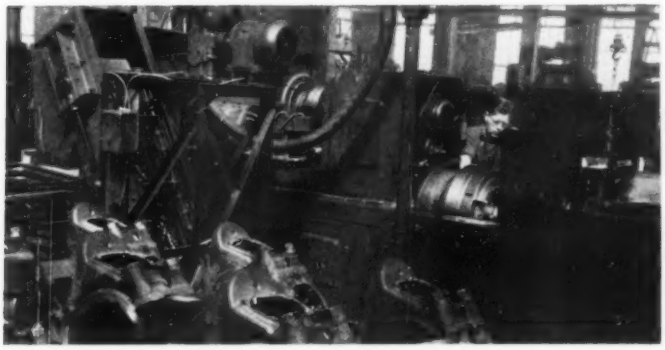
Rough-boring Ingersoll has two duplex heads with 4 carbide-tipped cutters on small end of arbor, 4 tools behind them on larger diameter. Magnet frame (sketch) for motor is blocked on center post of machine, clamped by counterbalanced cam-clamp lever, and slide is indexed to put smaller hole on center with arbor. After roughing cut, slide is indexed to put larger bore on center, and second ring of tools cut. Tools are slotted just behind carbide insert to reduce vibration damage to brazed joint of tool





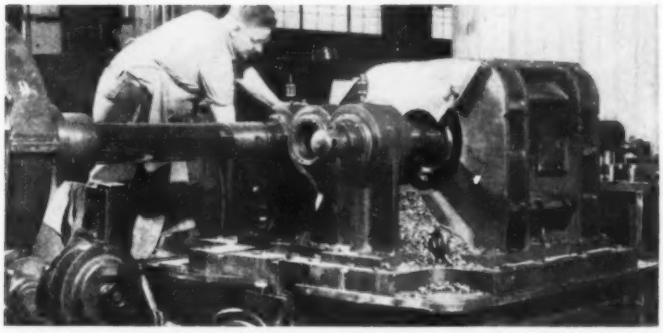
Cast-steel box frame for traction motor is bored and faced with W. F. & John Barnes twin-head 4-spindle automatic boring machine (finishing two fits) on each end simultaneously. "Beaver blocks" (sketch) carry carbide-tipped tools instead of conventional toolblocks. Work is mounted and clamped on center post; then machine goes through complete cycle from start position (with boring heads retracted) while indicator board above control panel tell-tales on feeds and motions. Machining cycle takes 12 1/2 min. Setup time on new job is about 9 hr

"Popper," a 7-ton hydraulic jack in a tong with plastic-impregnated wood faces and spring closure, is boosted to 18-ton capacity and powered by a 5-hp hydraulic pump and booster. Built at Erie, it removes bearing cap from magnet frame after boring. Cap is held on during boring by bolts and a drive fit in alignment keyway; formerly required sledging off, which was tough and dangerous

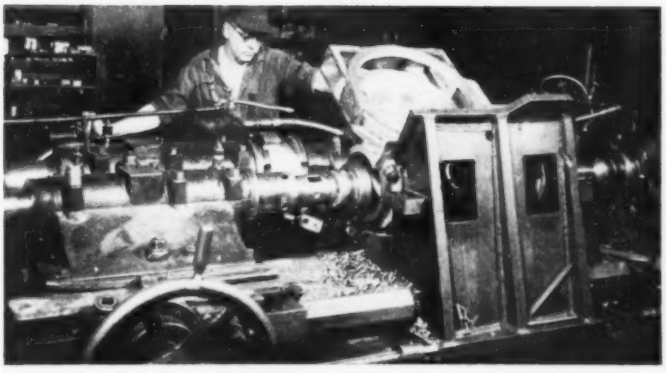


Metal-slat chip conveyor picks up chips from pit at center of machine bed, carries them to height of 7 ft and drops them into tote box. In foreground are rough-bored magnet frames, ready for finishing on next machine

GEARBOXES ARE SMARTLY TOOLED ON OLD MACHINES



Ancient Barrett drive still does effective job on boring out small gearboxes. Three bearings at each end of fixture support tooled arbors through casting; slide is shifted across ways to engage each arbor in turn. Tooling is partly brazed carbide tips, partly carbide bits mechanically held on steel stubs blocked into boring bars

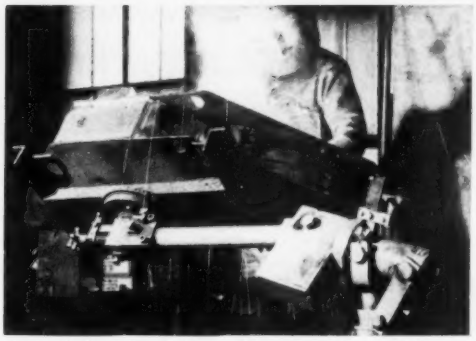


Larger gearboxes are bored and faced off by 4-spindle Newton machine, 1909 vintage, that has two spindles at each end of machine. Ways are cut off at the center to make space for the workholding fixture, which has gaging blocks attached. A straightedge across the blocks gages face depth

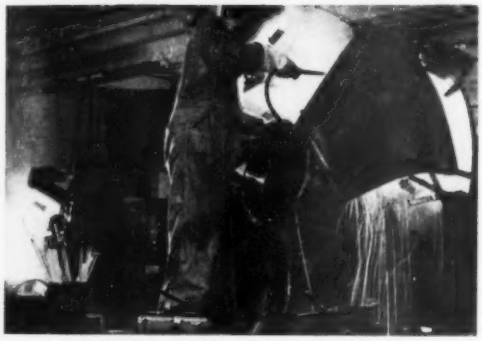
Double-tool slotter shapes toothed edge of inner rotor for clutch. Pratt & Whitney Model B has heavy carbide-tipped cutters which take heavy shock; require special grinding by expert to keep them from chipping. Table is fed in until tools break into previously drilled holes. Tools are spaced to straddle-cut one tooth

SOME ASSEMBLIES ARE WELDED

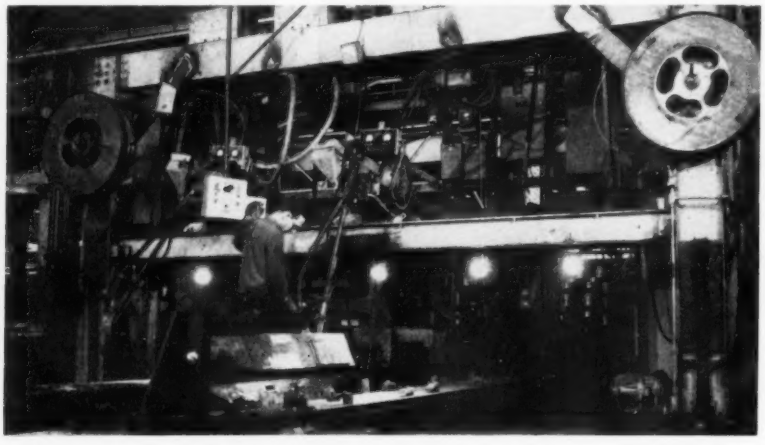
Welding operations have been centralized in the Welded Products Division, with the arc-welding bays enclosed from office and fabricating units, but no shielding beyond portable screens at work positions. Non-welding employees are required to wear protective glasses. Results of the concentration are higher average quality and smoothing of the work-load



Counterbalanced welding positioners made by Aronson are extensively used, offer increased versatility. The arm can be swung sideways by worm and gear to get the center of gravity of the work along the shank axis, then roller bearings in shank and head give easy motion. Strap clamps at joints can be tightened to prevent movement during chipping. Unit capacities are 500 or 1000 lb. The job shown, a gear case, weighs about 135 lb

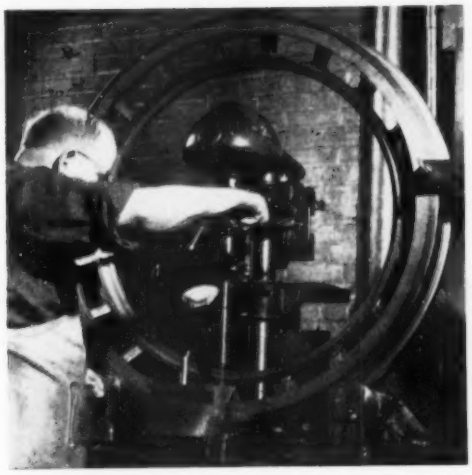


The 72-in aphonic (noiseless) fan for diesel-engine radiator cooling is assembled on a 6000-lb-capacity Ransome jig positioner fitted with clamps on the table and modified for foot-button control of table tilt and rotation. Operator, standing on a low platform, can thus weld collar, blade, and fanback seams continuously



Welding gantry with two Unionmelt heads is mounted on rails that cross the full 80-ft bay width, handles special shop jobs. Bed is T-slotted steel blocks set in concrete, allowing use of conventional T-slot clamps to grip work. Pendant control box sets speeds on gantry motion, head traversing, head raising or lowering, and governs automatic flux feed and recovery. Total span, rail-to-rail, is 17 ft

DRILLING IS NOT ALWAYS SIMPLE

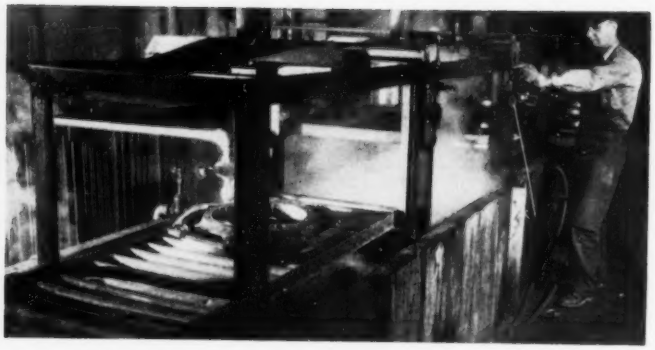


Armature head for traction generator is drilled and tapped to provide insulation-clamping holes on bench fixture with Delta drill. Baseplate supports two formed rollers on which ring rotates. Two clamps mounted up on angle plate attached to fixture, confine the ring to prevent tipping, but positive control is by index pin through slanted hole in bushing plate, which goes through previously drilled hole to locate ring for next hole

Radial drills do versatile production when equipped with trunnion fixtures. In this case, the trunnion supports remain on the table, trunnioned fixtures being interchanged to suit the job. Pivots are locked in by latch bars. For each of two types of main-frame castings for the diesel-engine governor, for example, three fixtures are provided. Parts are located on milled surfaces and clamped in so drill plates can be added or removed. Drills, taps, etc. are held in quick-change bushings on the shop table or in a rack. Those shown handle 34 operations. Safety shields have been removed from this Carlton radial for the picture

Two hardened and ground inverted V-ways support armature head for motor fitted over balanced mandrel on 4-ft by 13-in.-column American radial drill. Operation is static balancing. Operator tests balance of the head by rolling it back and forth, then rotates heavy side up and slips mandrel into notches at rear of the ways. Drilling lightening holes in periphery or hub corrects balance. Notches hold mandrel and head steady, so clamping while drilling is unnecessary

Worklifter for miscellaneous malleable-iron or steel parts for traction motors is Service 3-ton Leveler. Pallets are raised automatically to easy-reach height so operator can transfer part to table of Cincinnati-Bickford 3-gang multi-spindle drill. Eight spindles on each head do drilling, counter-sinking, and tapping in turn

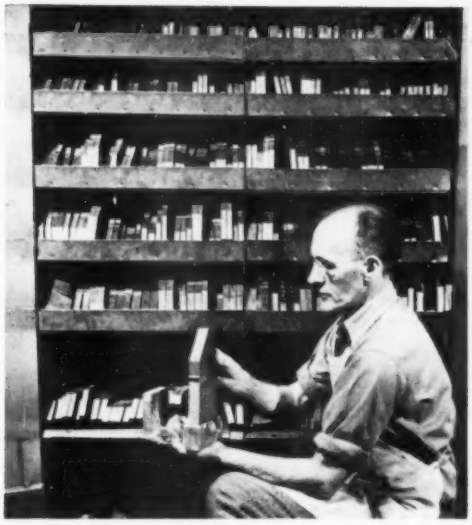


After machining, frame head for traction motor and similar parts are dipped in turn in caustic, hot water, and soluble oil to control rusting by pneumatic-controlled baths. Each tank is equipped with a section of roller conveyor supported by angle-iron frame; frame is supported by ram of Hanna double-acting air cylinder; cylinder is supported by outside angle-iron frame attached to tank. Operator pulls air valve to immerse part, then pushes and pulls to slosh the part, insuring liquid penetration into all holes

Two track-mounted radial drills move back and forth on separate sets of parallel 80-ft rails welded to "I" beams imbedded in concrete slabs. The 6-ft by 17-in.-column American Hole Wizards are on special trucks powered by electric motors and fitted with magnetic brake shoes that grip the track between the wheels, like streetcar brakes. Power-cable reel is sprocketed to truck axle to reel in or pay out cable as truck moves along track. Duplicate truck controls are on truck and on panel added to drill-control heads

BRASS PARTS ARE QUANTITY JOBS, TOO

Carbonways in navy-bronze brush-holding castings are cut by 60-ton hydraulic press supplied by 2200-lb pressure. Ram is fitted with 90° V-notched block that drives one or more broaches through work at various spacings—some operations requiring one thick and one thin broach. Job shown is casting with two equal slots 15/16 in. by 5/16 in. rough. Three sets of cutters with 19 teeth, spaced 3/16 in. apart on 4-in. cutting length, finish job to 1.0 in. by 0.375 in., traveling at 42½ ipm on downstrokes

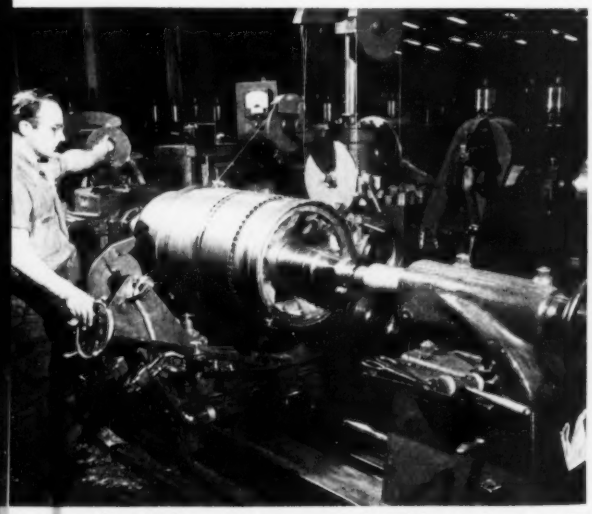


Broach cabinet holds about 900 cutters (half shown), ranging up to 6 in. by 1 in., including rectangular sections, hexes, rounds, and half-rounds. Average cut per face is 1/32 in. Tooling setup for press includes rough work-holders, notched blocks, and two or three sets of from one to three cutters each. Large casting in operator's hand will carry two brushes in same slot

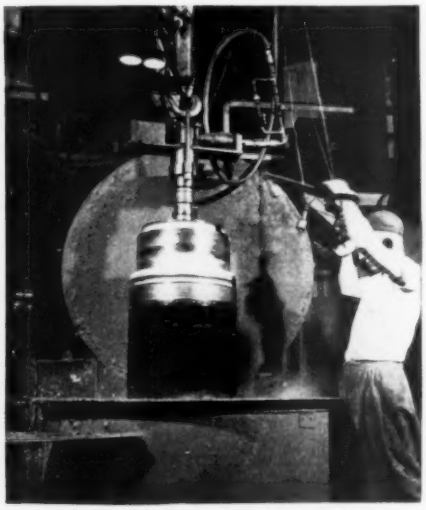
Commutator is assembled by loading segments of copper and mica alternately on rotary table. Clamping ring is tightened to hold assembly for subsequent machining operations

Armature coil is preformed and ends are flattened before glass-backed, Silicon-bonded mica tape insulation is wrapped by foot-controlled, motor-operated machine. Tape feeds to rotating bobbin, which circles around coil as it is fed through loop by operator. Traction-motor coils are treated with solvent-free varnish after wrapping

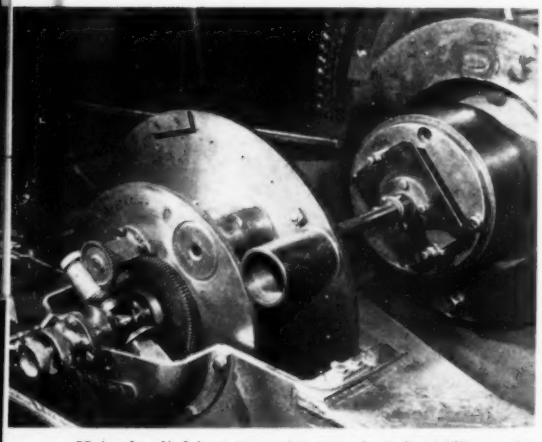
Generator armature in winding position on pedestals has preformed coils inserted in slots. Indexing bar at right of operator's hand is used to shift armature to position the slots. He places a coil, drives it into position in slot with soft-head hammer



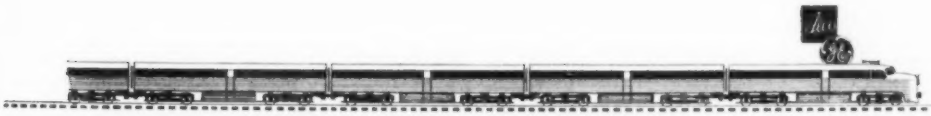
Armature windings are temporarily bound by steel wire while rotor is warm (100-125° C) to draw them completely into slots. Wire coiler winds and unwinds same wire continuously to squeeze windings. When windings are flush with bottom of wedge slots in armature core, impregnated molded-asbestos wedges are driven into dovetailed core slots to hold windings permanently



Two-ton Ingersoll-Rand air hoist and counterbalanced IR air drill lift armature into varnish tank, then lift it out and spin it to remove excess varnish. Air motor is geared to swivel that supports armature. Operator then washes off lower end and places armature in oven for baking

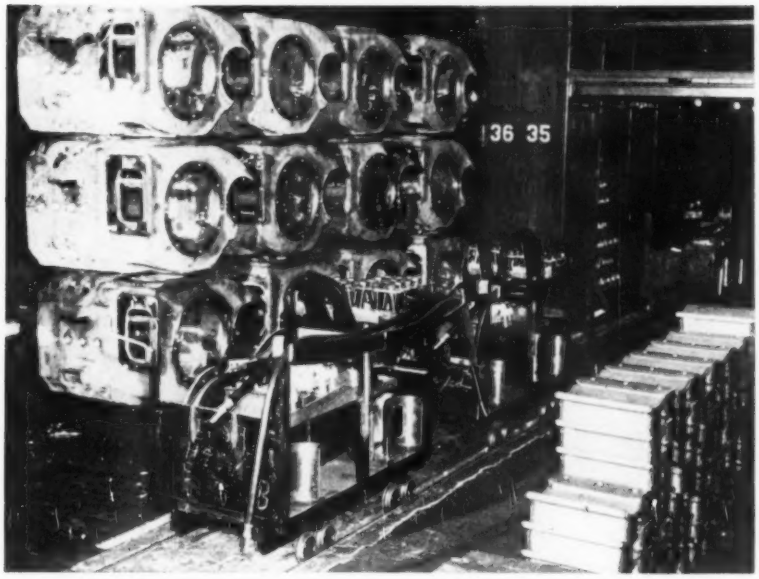


Motor in pit drives generator rotor by belt at 900 rpm for dynamic balancing each end of rotor separately by mechanical means. Differential disks in foreground (see closeup) show amount of unbalance. Small knurled wheel moves both inner and outer disks in relation to rotor; thus correcting for location or unbalance—larger knurled wheel shifts inner disk in relation to outer one by means of gears and two-way cone clutches; thus correcting for amount of unbalance. Gage dial on opposite side of large disk shows number of "points" (location) of unbalance, and weight-selection calculator indicates the amount of weight required to correct the unbalance. Typical correction is 30.4 grams per point

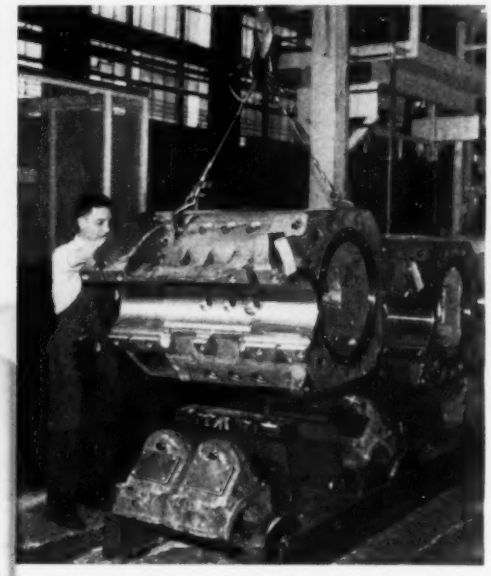


A separate room is maintained for babbitting split axle-support bearings for traction motors. Shells are clamped together with shims separating matching edges, then dipped, in turn, in caustic, water, and acid flux. Surfaces not to be tinned are painted with "whiting", then shell is dipped in 400 C tin pot (not in photo). Overhead chain hoist on monorail moves shell to caster. Centrifugal babbitting machine insures uniform casting on tinned inner surface of shell. Babbit, heated to 500C in pot at right, here is being ladled into spout of metal-feed tube to machine

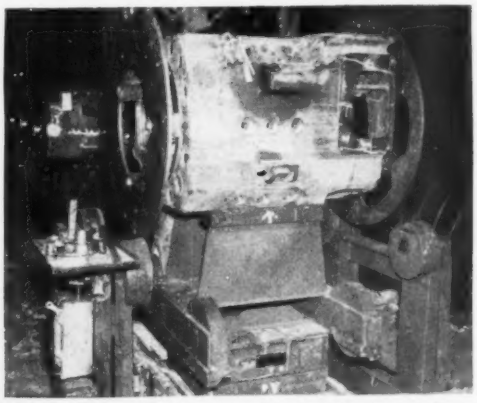
MOTOR ASSEMBLY IS ALONG A RAILROAD



Equipment is carried on cart that runs on tracks parallel to that on which motor is assembled. Stock bins in background are storage space for necessary components, required amounts of which are placed on each cart. When assembly is complete, cart and motor dolly are returned to head of line

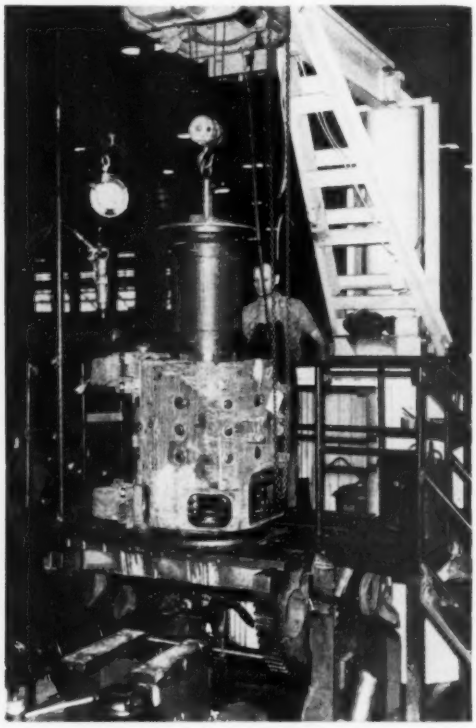


Traction-motor frame casting is picked up by overhead crane and deposited on wheeled dolly that carries it through all assembly except where special handling equipment supports it for operations

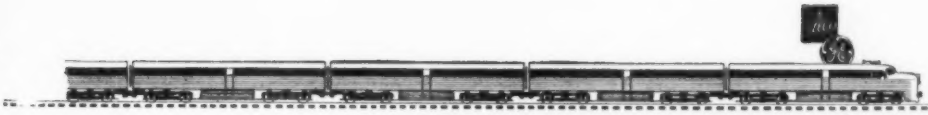


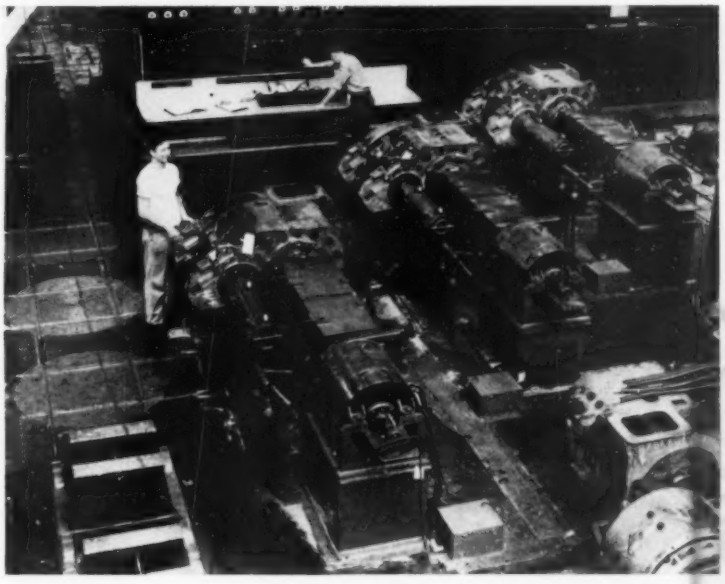
When rollover of partly completed motor is required coiling plates are bolted to ends of frame, then dolly is run over floor elevator which lifts frame above spreading trunnions. As frame is lowered, trunnions are brought back to position to catch coiling plates in grooves in the trunnion wheels, thus supporting the frame for easy indexing by powered drive while coils and pole pieces are installed

Upending table, operated by gears, tilts motor frame ► to vertical to allow armature to be dropped into position by boom crane. Pendent box controls all motions, so confusion is avoided. After assembly, frame head is bolted on and motor is replaced on dolly to be moved to testing area



Overhead crane is used only once during motor assembly to lift armature into upending device in assembly preparation area. Bearing booth here is where bearings are removed from armature, cleaned in dirt-free room, then packed with grease and pressed into frame heads



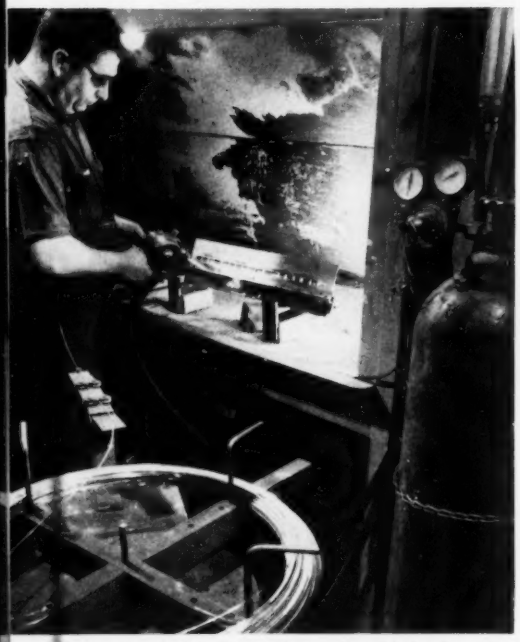


Complete precision test of motors is made at panel, where operator and helper can check three units at once. Special handling and aligning devices permit positioning units for test without using overhead crane. Frame dollies, for example, are switched off main track by turntables, taken directly to test stand. After test O K, motor is released to shipping section

OTHER ELECTRICAL PARTS

Relays, Switches and Contactors are Mass-Produced

Wipe and gap motions on the four contacts on an electric panel relay are adjusted and indicated both electrically and mechanically in this fixture. Contact is shown by the lights in front, through a plug in the rear, while the armature is linked to the dial indicator to show correct gap and wipe going in and out. Adjustment is made with specially-made wrenches of various sizes, each essentially a strip with a sawed slot to fit over a copper contact with either a T or L handle to provide leverage. At back is a concave, magnifying shaving mirror on a stand so the operator gets a rear view. Overhead lighting is adjustable fluorescents



To improve electrical contact, armature blades for relays are sprayed with copper. The gang fixture has window slots to expose contact area only; blades are held in by spring clips in the rear. A down-draft booth exhausts fumes from the Metco gun, which is served either from plant acetylene and oxygen lines or from tanks

Compact and well-arranged work position permits operator speed in riveting four shunts and four fingers into slots in a connection block. From a tiered feeder at right, the operator takes a shunt and a finger, places them in position in one of the four slots of the plastic block and trips the pedal of a General riveter to feed and drive two rivets in turn. For greater safety and convenience, the connection block is socketed in an aluminum holder. Another tiered feeder is provided at left for additional capacity for more complex assemblies. Six sample assemblies of various types are mounted on the operator's instruction board at left

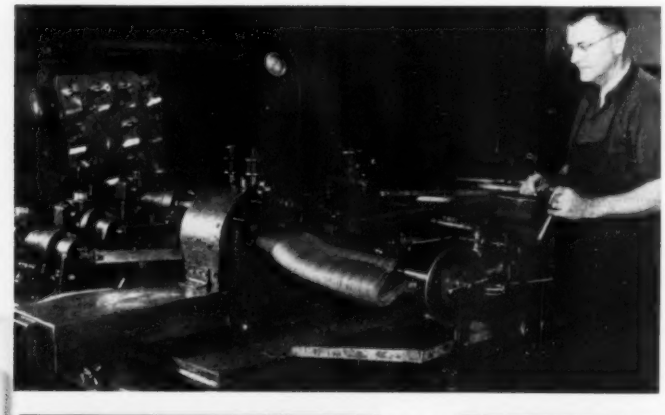
Open stock racks hold all stock of parts and sub-assemblies near each assembly position, as in automotive practice. This simplifies storage, reduces lost time at assembly position, provides visual evidence of impending shortage or overstock. Small parts and hardware are stored in tote boxes or other containers for easy handling

Job-lot production of dozens of models prohibits high refinement of equipment, but versatile handling and holding equipment has been developed for many jobs. Here, completed air-operated contactors are mounted by their plastic-impregnated bases in a combined transport and test rack. Each contactor is socketed at the lower end and held by a rotatable latching strip at top. Stub air connections and electrical contacts are built into the rack for test purposes, and the entire rack is on casters for transport from assembly to test area

Screw-machine products are dispatched from central storage and inspection area in background to line of a dozen cross conveyors serving second-operation machines; bench drills, millers, small lathes, tumbling barrel, cylindrical and centerless grinders, belt sanders, and the like. Small batches of parts are inserted in bags or tote pans, then routed to necessary machines

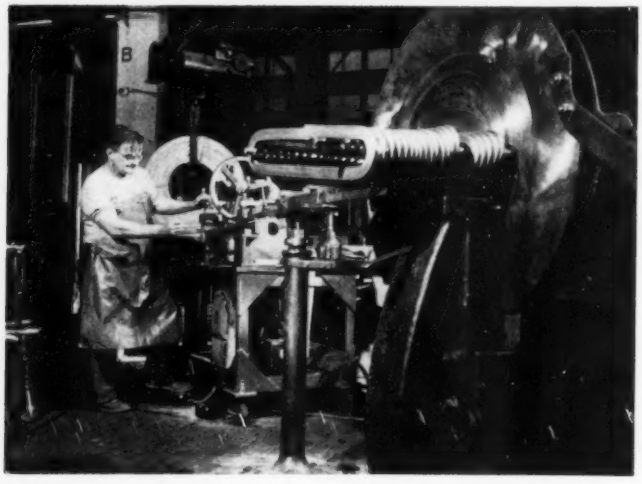
Planishing has replaced straddle-milling of the cast-copper connector block for reversing switches, saving material and speeding the operation, while providing a better more compact conducting surface. A simple fixture in this 200-ton Watson-Stillman hydraulic press compacts the lug surface, and maintains accurate thickness dimensions formerly procured by machining

COILS ARE EDGE-BENT FROM STRIP

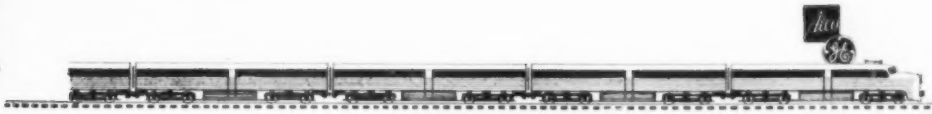


Edgewise elliptical-coil benders developed by GE are hydro-mechanical. A group of three (one shown), handled by one operator, bends double load-resistor coils from strip 0.07 in. thick by 0.6 in. wide, or 0.052 in. thick by 0.5 in. wide. Coils are about 2 x 4 in., but this is readily adjustable. Strip, of iron-aluminum alloy, is fed from coils on reels, oiled in an aligning sleeve, then fed into the head by gripping fingers on a slide behind it. Then a clamp grips the stock, another ram rotates the head 180°, and the cycle repeats. During head rotation, the twin strip is held behind a plate which has a slot through which the finished coil is fed onto a mandrel

Circular resistor coils are wound edgewise in two revamped lathes. Coil stock is held in a reel (with interchangeable cores to suit width) and the end fed into a slot in a housing below it on the modified lathe carriage. In the lathe head is gripped a long core mandrel, with a slot at the head to catch the strip end. At the start, the carriage is held closely against the mandrel head by a sleeve under pressure of a long-stroke air cylinder (right rear) replacing the tailstock. Rotation of the lathe chuck thus winds the strip into a coil, guide surfaces in the housing and tailstock pressure keeping the coil tight and preventing buckling. Lubricant is provided at the housing. Housings are interchangeable (others above air cylinder at right rear) to fit various core diameters and strip sizes



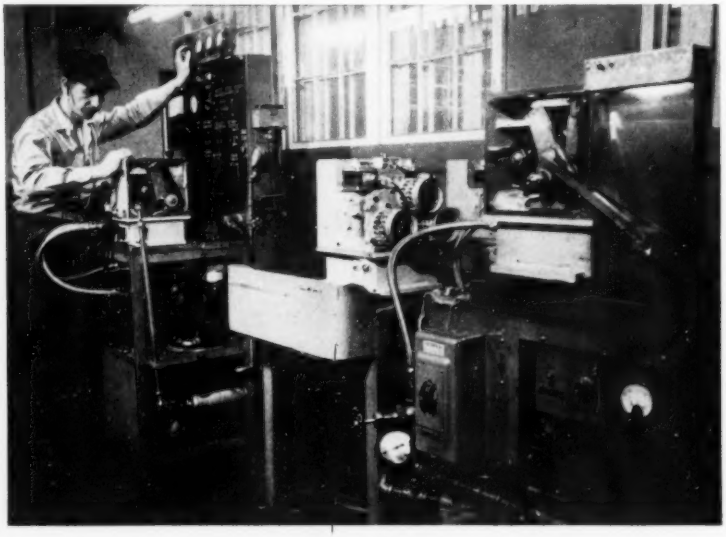
Copper coils for motors and generators are produced in an edgewise winder, an entirely mechanical unit with planetary motion. Here, 14-turn coils about 4 x 15 in. are being made from ¼ x 1-in. copper. The copper coil stock is placed by chain hoist on a vertical-axis reel and fed through a straightening and oiling sleeve to the planetary head. The latter moves alternately to each end of its slide, stopping at each extreme while the head makes a 180° rotation to form the coil. Finished coil emerges from a slot in the face disk, onto two bars. A portable table containing vise and resistance heater on slides permits one stock coil to be brazed to the end of the preceding one to reduce copper wastage. Ends are trimmed and filed square, then bent 90° temporarily to fit the brazing fixture (shown). Brazed joints are filed to size. The operator cuts off coils of required number of turns with a hand bolt cutter



Copper thickens appreciably at the inner radius of the bend when coils are formed, creating the danger of crushing the insulation and shorting the coil in service. So coils are laminated at the ends with steel plates, then pressed to return coil ends to original thickness. Thereafter, the coil is put in this Farquhar 2-way press for "pressing" the form. The coil is laid on a steel block, a 3-part filler mandrel inserted, and a top block applied. The press "snugs" the coil sides at low pressure (40 tons), then the vertical ram snugs the top. The operator kicks the pressure-shift pedal, to double vertical-ram pressure for forming. Capacities of rams are 100 tons horizontally and 200 tons vertically. Here forming has been completed and the operator is withdrawing the coil

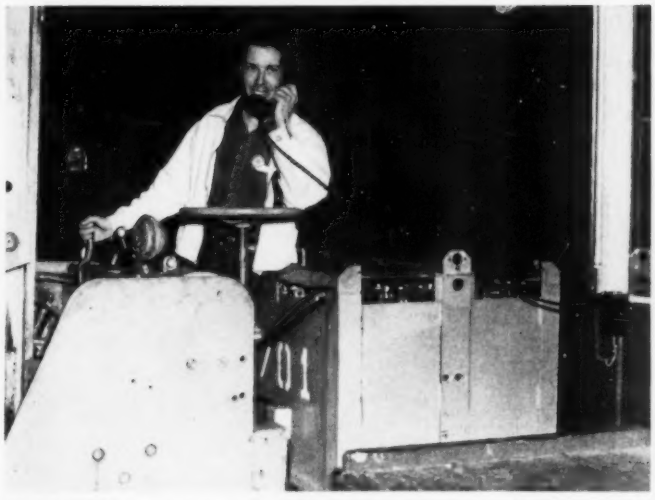
Load resistors for generators are assembled in this versatile fixture, which can handle any of the lengths of coil produced, together with various connector and spacer arrangements. The wound coil, with resistance-welded end connections, is simply lengthened by hand until its turns drop into the slots. Ribbed ceramic insulators (in this case, ten) are placed along the collapsible slide, which is then pushed by rack and handwheel into the coil. A lever expands the slide and slots in insulators engage appropriate coil turns, then the steel spacer is hooked to the slide end and the slide withdrawn. This pulls the spacer into the coil, holding the ceramic insulator forms out tightly, and completing the assembly

Governor valve sleeve is rough-honed on a Sunnen hone. Sleeves are hardened and finish-honed on a Micromatic Micro-Sizer. This machine is equipped with an automatic sizing ring which stops the operation when desired size is achieved. The fixture is rotatable, so one socket can be loaded while the other is in use, or the operator can run both machines, as this apprentice is doing

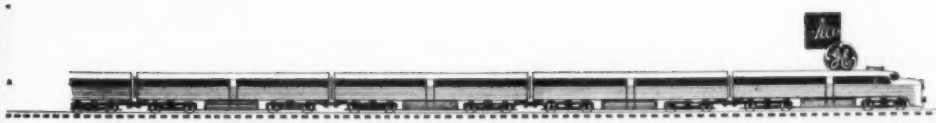


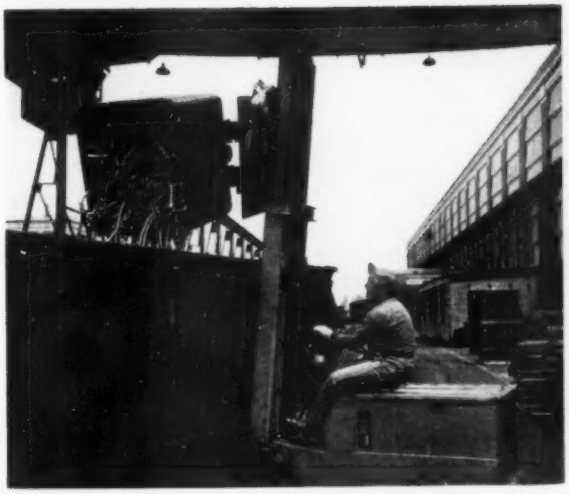
Speed governors for diesel engines are assembled in a controlled-atmosphere room, then passed out through a trap on a roller conveyor to this test area. Two test stations are shown; that at left an operational test at various speeds with an air motor simulating diesel action; that at right a check of the governor output shaft. Tests are practically automatic after setup. Governors are moved from station to station by chain hoist on a monorail. Test operator also applies cover plates after test is concluded

MATERIALS HANDLING IS MECHANIZED



Jitney-dispatching system works two ways to supply trucks where needed, but not waste time and batteries in making regular rounds. Each department has remote monophone handset located at a point selected for all receiving and shipping. Lifting phone starts buzzer at central control office, also operates plunger annunciator which records call until answered by dispatcher. Separate line from control panel to each remote station powers lamp to indicate dispatcher has trip or job for truck there. Dispatcher calls garage at start of shift, assigning trips to jitneys. Drivers call in from nearest remote station when job is done, then get reassigned or wait there for new trip. Dispatcher initiates assignment by flashing light at remote station, then driver calls him



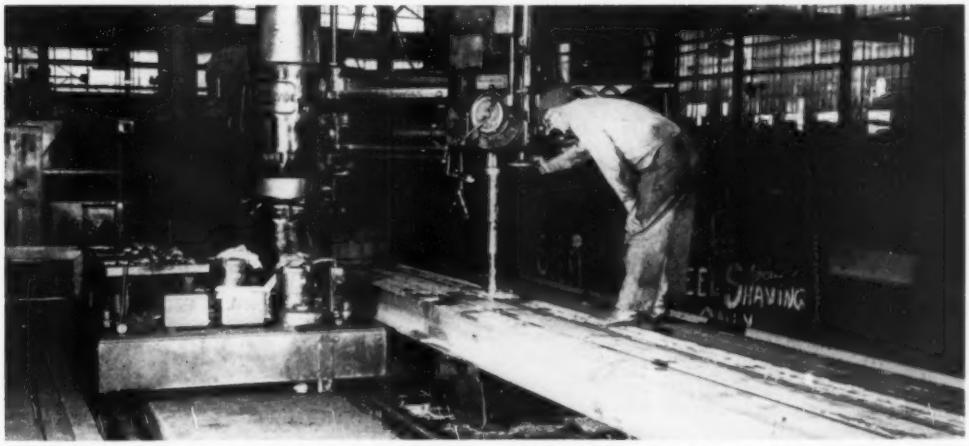


Tilting-elevator lift truck has rotating fork-supporting plate that swivels 360°. Chip cans have enclosed channels into which forks fit. Can is lifted from machining area, jitneyed to dumping area or gondola car, dumped by rotating the fork, then returned to machine. Channels go the long way under 36 by 42 by 36-in. deep cans

Completed traction motors weighing 7245 lb each are loaded uncrated into special gondola cars provided by New York Central and Nickel Plate for transfer to Schenectady. Eight are positioned at each end of car, centering load over axles, and leaving middle of car for auxiliary equipment. Blocked-up wooden bases nest motors

NOW FOR THE LOCOMOTIVE FRAME

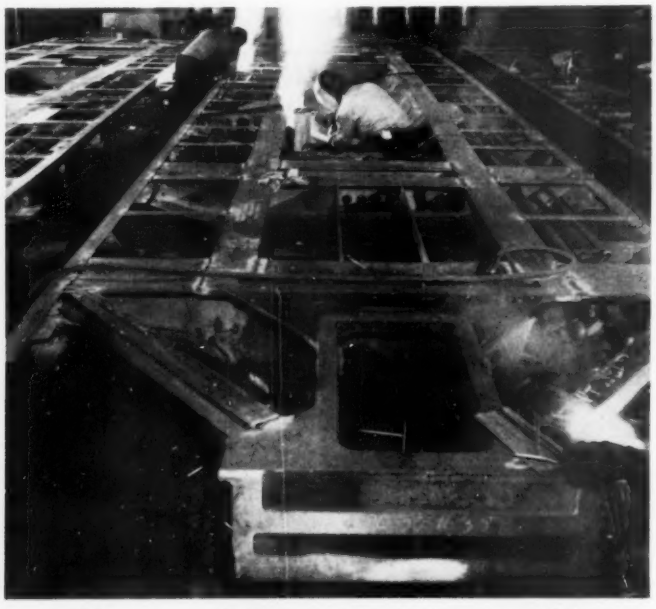
It's An Assembly of Structural Shapes and Castings



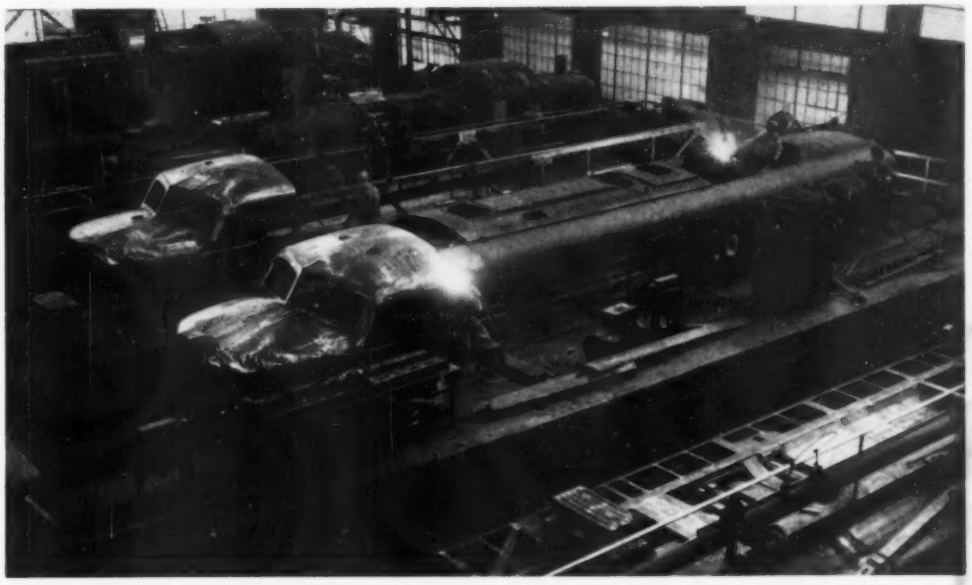
Forty-foot H-beams for locomotive floor frames are drilled for piping at Alco by this track-mounted Cincinnati-Bickford 6-ft radial. Beams are unloaded from flat cars in the erecting shop, where final locomotive assembly is completed, and are laid out, drilled, and burned—allowing a straight flow of materials

Structural shapes are clamped to floor plates. Two floor frames are worked at once on these plates so that fitters and welders can switch off from one to the other with minimum setup time. Frames are worked upside down on floor plates to allow accessibility. Cross ties and draft gear are preassembled in fixtures nearby

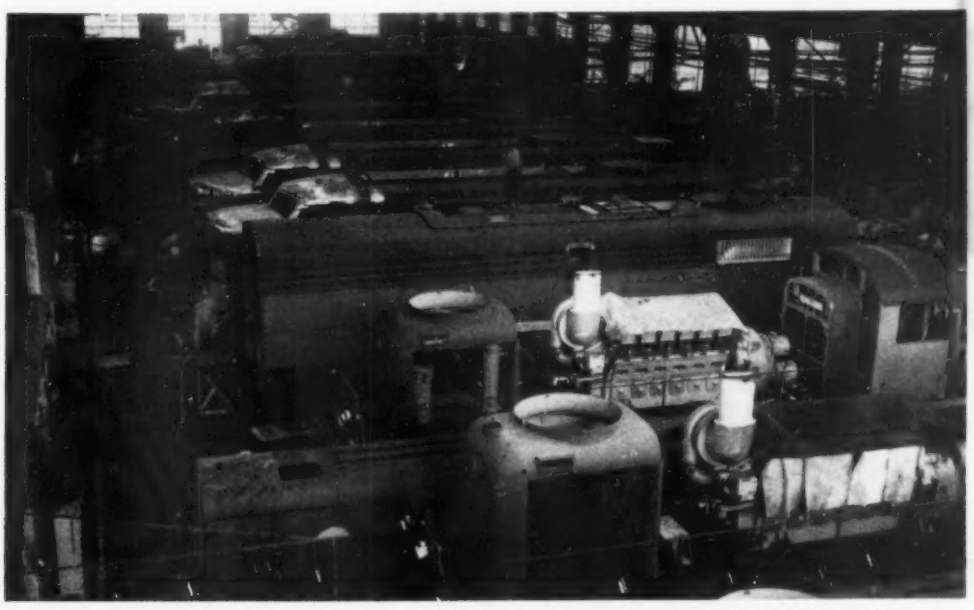
Frames are turned again and cable cleats, wear plates and other underframe equipment are welded. Piping is also tested here with an air line and air test torch—a flame which will be blown sideways by air from a leak



Frames are transferred to horses, turned right-side-up, and tops are welded. Road locomotive frame is shown here, although switcher frames are constructed in a similar manner

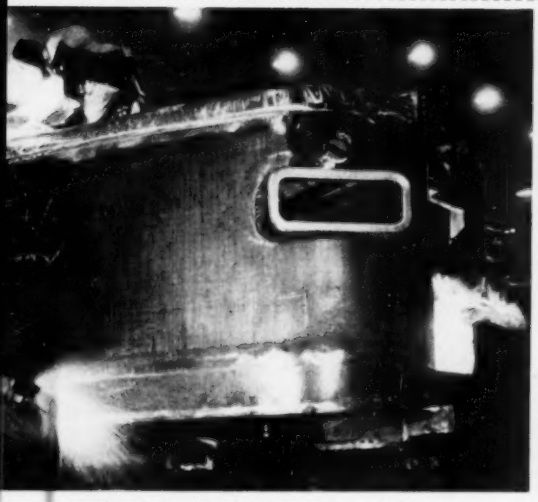


Frames are then placed in fixtures, and side trusses, roof and nose are added. Other pre-fabricated components are added. When removed from fixture, locomotive structure is complete and ready for installation of equipment



Alco-GE diesel-electric locomotives are now being produced at record rates on this typical assembly line at Alco. A switching-locomotive assembly line parallels the road-locomotive line shown here

LASTLY—FINAL ASSEMBLY



Completed structure is removed from fixture and set on stands on assembly line. Minor welding is completed and weld seams are ground and buffed

The diesel engine is lowered into the structure, side plates are added, and the unit is picked up by giant tongs for application to trucks

This wheeling operation completes major assembly. The locomotive is tested and adjustments made. Next: paint shop

ROUND TABLE

New Eyes

"Say, Ed, don't think I am butting into your business—but how is it that Benner is spending his time just walking around the shop? He looks like he's the foreman the way he meditates here and there."

"Good! It's working out just as I expected it to, Al! It was my idea to have a man do nothing for one day but look around for improvements; next week I'm going to let Harris have a day of it."

"Isn't that the foreman's job?"

"Don't tell me, Al, that you're one of those fellows who think a foreman is a superman! Don't you realize that lots of things will pass you by when you're busy with regular griefs? There's nothing like having an unoccupied mind to get hep to new ideas—just try it out sometime on the quiet."

"The fellows will think I'm nuts if I go around with an unoccupied look on my face, Ed—in a production shop."

"What do you care what they think? Try it out just for the Hell of it, will you?"

"I'll leave it to you to experiment with that one; I've got too many things to attend to. I can't put half my own ideas into practice for lack of time."

"I have some ideas I think are hot, too, Al—and they don't get done. But if Benner turns up with the same ones—or better ones—maybe he and some of the other boys will help me get 'em into practice. Why don't you like the idea?"

"It's taking a man off his regular work, and I'm afraid it'll sort of enlarge his dome a shade—he's likely to think that you are using him to save your own efforts, Ed."

"Not after I give him the idea of what it is all about. Now you take Benner, for instance; I said to him this morning: 'Tom, I want you to drop your job for today and spend your time looking around the shop—look at each machine and see for yourself just what you think'll be worth changing.' I told him it would give him a general picture of the whole shop that would make him more valuable to the firm and to himself."

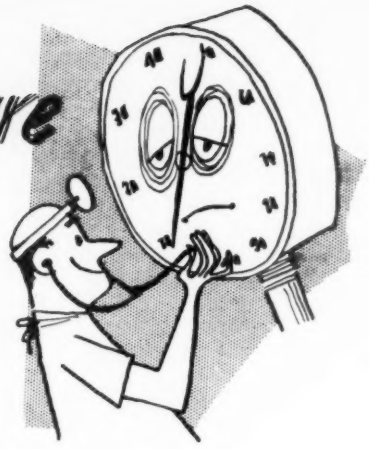
"You know what he'll do, Ed?" laughed Al, "He'll spend half his time looking around and the other half telling jokes."

"I'll bet you a good seat to the World's Series that Benner's observations today'll result in one or two money-saving ideas—maybe more!"

"I'll take that one. I'll bet all you come up with is no place to charge one man's time for one day."

ARE "NEW EYES" a help to the executive—either from his own staff or from outside? How can he supplement his own planning—and get his men to put in the effort necessary to execute improvements in the middle of a production rush? Your ideas and opinions on this subject will interest others. Discussions of earlier topics appear on later pages.

Watch Air Pressure



Need a new compressor? Don't be too hasty. If you're not getting full pressure at the tool, make sure you are not wasting air through leaks, or overloading pipeline capacity

BY EDMOND C. POWERS, Educational Director
COMPRESSED AIR & GAS INSTITUTE

Low pressure in a compressed-air system is the principal factor in bringing about unsatisfactory performance with air tools. Regardless of the pressure at the compressor, it is the pressure at the tool itself that is important, as this is the point at which the air is used as power. Most pneumatic tools, for example, are designed to operate at 90 psi at the point where the air enters the tool while the tool is operating. If the pressure at this point is below 85 to 90 psi, it should be considered too low, as it reduces the ability of the tool to do the maximum work for which it was designed. This, of course, means that more time is required to perform a given job with a given tool.

There are three principal causes of low pressure: insufficient compressor capacity, inadequate piping, and leakage. When it is found that pressure is too low, the first inclination is to install more compressor capacity. This is not necessarily the correct answer. It should first be determined whether the compressors are at full load when pressure is low. If they are, then more capacity may be needed, but consideration should first be given to the two other principal causes.

A good measure for the adequacy of piping is the pressure loss between the receiver and the point of use. In a well designed system, this should not exceed 10%. The absolute maximum drop at the worst point should not exceed 15%. If the drop is greater than 10% average, 15% max. throughout the entire system, including hose, attention should be given to correction of this fault before considering increased compressor capacity.

The third cause is leakage, or loss of air without doing work. Permitting excessive leakage is the same as exhausting the compressor output directly to atmosphere. Obviously, if leakage is eliminated, the air formerly wasted will be available for useful work. The expense of making lines tight will unquestionably be less than the installed cost of a new compressor, and the daily power saving may be considerable. The gas industry considers a loss of more than 1 cu ft per minute per mile of 3-in. pipe as excessive.

Effects of Low Pressure

There are few uses of compressed air not vitally influenced by low pressure. All portable pneumatic tools, hoists, transfer and conveyor systems, paint sprays, sandblasts, oil burners and other equipment operate less effectively when proper pressure is not maintained. On the other hand, correct pressure will result in increased production and lower unit cost.

On portable pneumatic tools, for example, an average increase of 37% in production can be obtained for about 30% increase in consumption, by increasing the pressure at the tools from 70 to 90 psi. The accompanying table shows the savings effected on a typical installation of 20 grinders operated from a $8500 compressor plant when the pressure is increased from 70 to 90 psi.

Assuming that only one-third of the 37% increase in productivity can be translated into labor productivity, it is evident that 12% more metal will be removed at 90 psi than at 70 psi. The work previously done for $328 can now be done in less time and will reduce the cost to $330.88 divided by 1.12, or $294.71. Thus, even though air costs are increased, there is a net saving of $33.29 per day, or about $8500 per year—equal to the first cost of the compressor plant.

Looking at this another way, when pressure is increased to 90 psi, the tools require 120 cfm more air. A compressor installation to supply this would cost $2200. The saving of $33.29 per day would pay for this new unit in 68 working days.

When the question arises of purchasing additional capacity, as opposed to making other arrangements for the operations involved, it should be remembered that adding to compressor capacity frequently affords protection for equipment other than pneumatic tools. This would include air chucks, air ejectors for presses, sandblast, paint sprays, and other air-operated equipment.

Remedies for Low Pressure

Faulty air power conditions are usually caused by poor planning, or by increased air use without corresponding system expansion. Plantwise analysis

should determine the full extent of low air pressure and present air-flow requirements.

Pressure loss varies roughly as the square of the velocity. A 3-in. line, 1000 ft long, will handle 500 cfm with a 2.5-lb presure loss, but a 4-in. line will pass about 1000 cfm with the same drop. The installed cost of the 4-in. line, however, will be only slightly more than that of the 3-in. line, because most of the cost is labor.

Methods of increasing line capacity to reduce pressure loss, and improve conditions at the point of use, vary with different installations. One may call for a line paralleling the original, with frequent interconnections; another may require installation of a loop system with some outlets taken off the new line to relieve the old; and another may require a complete new system. Branch lines and manifolds for tool attachments should be planned oversize.

Selection of the proper hose is also important. Losses of 15 to 25% in pressure are frequent in the hose alone. Never use a hose longer than is necessary for proper freedom of movement.

Every cu ft of leakage eliminated is clear gain. Such losses may reach 10 to 20% of the total air compressed. An air leakage test should be run on the entire plant, and every section of hose should be tested. Even though leaks are usually small, they may be numerous, producing a high total effect. A single 1/16-in. hole will waste 182,000 cu ft per month, at a cost of $9.20. The most likely locations for small leaks are around valve stems, in hose connections, unions, drains, home-made blow guns, and lines leading to inoperative tools.

Elimination of leakage involves making the system tight, and then keeping it that way. Regular inspection is mandatory. Only after it has been determined that the distribution system is adequate and that leakage has been eliminated, should an increase in compressor capacity be considered.

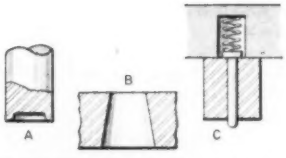
COST TABLE FOR HIGH AND LOW-PRESSURE AIR

Operating pressure at compressor, psi	100	100
Operating pressure at tools, psi	70	90
Tool load factor	33%	33%
CFM req'd per tool (max. load)	50	68
Number of men and tools	20	20
Total cfm used	333	453
Total cu ft used per 8-hr day	160,000	217,600
Cost of air per 1000 cu ft *	$0.05	$0.05
Cost of air per day	$8.00	$10.88
Increased air cost	——	$2.88
Labor per 8-hr day (Incl. burden)	$16.00	$16.00
Total labor cost per day	$320.00	$320.00
Total cost per day	$328.00	$330.88
Ratio of air cost to total cost	2.4%	3.3%

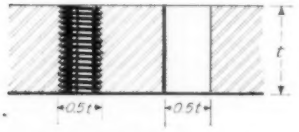
* Air cost is based on power at 1c per kwh, fixed charges at 15% of installed cost, plus labor and supplies.

DIEMAKER'S KINKS

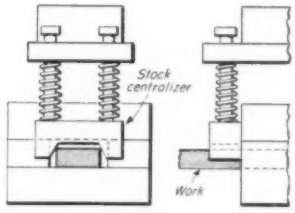
BY FEDERICO STRASSER



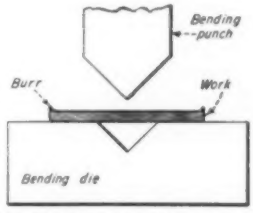
IF BLANKS STICK to the punch, try one or more of these suggestions: (1) Relieve the punch face as at *A*, (2) make the die opening completely tapered as at *B*, or (3) incorporate a spring-backed shedder in the punch as at *C*.



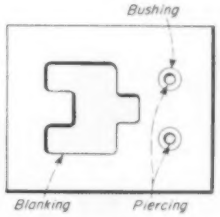
SCREW DIAMETERS for fastening die blocks, strippers, stock gages, should bear a certain relationship to the thickness of such members. As an empirical rule, make the screw diameter equal to half the member's thickness for parts up to ¾ in. thick and approximately 40% for greater heights, within reason. Dowels, in general, should have the same diameter as the screw OD.



ACCURATE central punching of strips is often important, but there is always some play between the strip and the stock guides. In such cases, a stock centralizer is attached to the punch-holder and the inclined surfaces serve to centralize the strip under the punches.

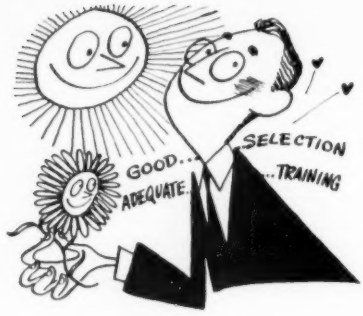


LOAD BLANKS in bending dies with burr side up. Better registration against the top is secured, also the burr is flattened by the punch.



PIERCING OPENINGS in progressive dies wear faster than blanking apertures, as a rule. In high-quality dies, therefore, it is good practice to bush such openings to permit easy repair.

Most potential foremen need leadership training to develop into fully effective supervisors . . . Here is how International Harvester does its training job



ARE YOU TRAINING TOMORROW'S LEADERS?

BY F. H. REED, Manager, Education and Training Dept.
INTERNATIONAL HARVESTER CO., Chicago 1, Illinois

MANAGEMENT wastes a great deal of breath these days complaining about the inadequacies of first-line supervision. Yet, frequently we make only half-hearted efforts to develop the qualities of leadership we insist are so necessary to sound foremanship. When we need a new foreman, we line up a group of employees and choose the one with the most seniority, the one with the best production record, or perhaps the one who parts his hair according to our own idea of the way it should be parted. We select this man and say to him, "Now, you're a foreman! Beginning tomorrow, take over the department."

This example is only slightly exaggerated. When we give this kind of cursory consideration to a foreman's appointment, have we any reason to be surprised that he smiles when we later try to point out how important his job is?

We don't select precision machinery in any such haphazard manner. Why, then, should we be any less thorough in the selection of supervisors? Frequent turnover and poor employee relations can be just as disastrous in the long run as high scrap loss or low production.

Two major elements are necessary to a successful program of leadership development — good selection and good training. They are equally important; one can quickly be rendered ineffective by lack of attention to the other.

Select Carefully—Train Well

To get effective leadership in industry, we must give more consideration to the raw material we select for processing. We must know precise job requirements, then ferret out — through testing and interviewing — the qualifications necessary to meet those requirements.

Once the selection has been made, our job becomes one of development. The key to this development is a comprehensive program of education and training. In this, we must aim at the development of the *whole* man, not job performance alone. We also must not lose sight of the fact that we are dealing with adults. Adult education must consider the past experiences of the trainee, his preconceived opinions—ideas that are already pretty well formed. Adults don't accept new ideas just because somebody "tells" them.

Harvester's Leadership Course

Before World War II, International Harvester tended to follow the usual pattern in selecting its first-line supervisors. There were sporadic attempts at developing a program of supervisory training during the previous years, but it was not until 1946 that the Company settled upon a systematic program aimed at the selection and development of potential foremen. Early that year, a leadership course was set up in our manufacturing plants to meet the pressing need for supervisory personnel in a vast postwar expansion program. Its purpose is to accelerate the development of promising employees for first-line managerial positions in both shop and office.

Candidates for this training are drawn from the rank-and-file. Each is recommended by his foreman and one other managerial employee familiar with his personality and job performance. He must be under the preferred top age-limit of 35 and must have at least one year service with the Company. Candidates are tested for intelligence, aptitude, and interests, and are carefully screened by the training director and interviewed by individual members of a Leadership Committee consisting of the works manager or his assistant, industrial relations manager, training director, and the candidate's superintendent or department head. If candidates meet all requirements and successfully pass a medical examination, they are referred to the works manager for final approval.

Employees are admitted to this training in accordance with current and anticipated requirements for additional supervisory personnel. Graduation does not guarantee managerial status. Each candidate understands at the outset that the course is intended only to equip him more fully for such status when, and if, he is chosen for a managerial position.

Fundamentals of Leadership

Harvester's leadership training is divided into two parts: "Fundamentals of Leadership" that runs for 20 weeks, and "Leadership in Operation," for the final 6 weeks. During the first part of the program, students remain in the departments to which they are regularly assigned and spend two hours each day in classroom sessions. The remainder of their time is devoted to individually scheduled work experience. Classroom sessions are taught by the works training director and his staff who are assisted wherever possible, by personnel from line and staff departments. Subjects studied in this period fall into four general areas: *PERSONAL DEVELOPMENT:* Analysis and discussion of qualities that make for successful leadership; responsibilities, requirements, and prerogatives of a supervisor. This area also includes practice in the development of personal skills such as speaking, writing, and planning department work.

COMPANY ORGANIZATION AND POLICY: Study of the development of International Harvester with emphasis upon organization and policy. Features of the American enterprise system — and the company's place in that system —also are discussed.

PERSONNEL RELATIONS: Explanation and discussion of the human skills of management with stress on the foreman's role in maintaining good employee relations. Basic to this is a working knowledge of practical psychology: Why people behave as they do, individually and in groups. Typical subjects in this area are Practical Psychology, Job Instruction, Discipline, Labor Laws, The Labor Contract, Grievance Handling, Safety, Personnel Procedures, and Employee Information.

MANAGERIAL CONTROLS: Detailed examinations of the techniques and procedures that help a foreman meet the requirements of production, quality, and cost necessary for profitable, efficient operation of his department. Such subjects as Materials Control, Material Handling, Quality Control, Cost Control, Wage Administration, and Manufacturing Standards are typical in this area.

Outside the classroom, students follow a definite schedule of rotated work experience that is fitted to individual needs. It is here that the student learns to accept responsibility and acquire the administrative skills so important to good foremanship. Special coaching is given as needed in all phases of departmental activity.

Leadership in Operation

Before a student is permitted to go on to the second part of the course, he must have satisfactorily completed Part One. Training in this final six-week period consists of full-time work experience in such staff activities as methods and rates, industrial and labor relations, materials control, and planning. In some of our manufacturing works, this schedule is varied to include such other staff departments as accounting, mechanical engineering, or inspection.

As in the case of the shop work experience, schedules in this part of the course are developed cooperatively by the training director and the department head involved. Stress is again given to the student's own needs and interests and special coaching is provided when necessary to make the learning experience more effective and meaningful. Students meet once a week during this period in informal four-hour conference to discuss problems of over-all policy. Staff department heads, members of the works management group, and the training director, take part in these discussions.

The importance of careful evaluation at regular intervals in any training course cannot be overestimated. We believe strongly in this at Harvester and are doing more and more of it all the time in our various training programs. In the first part of our Leadership Course, monthly progress reports on the work experience of each student are made by the general foreman and the training director. Objective tests on classroom instruction are also given. In the second phase of the course, the student is required to make a report on each assignment given him and on any special project which he has completed. Personal conferences with the training director and individual members of the Works Leadership Committee are arranged for each student during this phase of the program.

More than 500 Appointments

Upon satisfactory completion of the 26-week course, final placement is made by the works manager according to the abilities of the student and the vacancies available at the time. To date, more than 500 employees have, through this training program, been elevated to managerial status at our various manufacturing works.

In an industry so varied and whose operations are so scattered as the International Harvester Company, any training program must be sufficiently flexible to meet local and current requirements. Our leadership course is no exception. Because of the pressing need for foremen at some of our works —particularly the newer operations—this 26-week schedule has in some instances been shortened to half its normal length. This flexibility is important if training in industry is to be effective.

The need for industrial training has increased rapidly in recent years and indications are it will continue to do so. The new national emergency is placing added demands on our facilities and the need for capable foremen will be greater as time goes on. If we are going to meet the growing need for effective supervisory employees, it is up to us to develop them both by good selection of the raw material and by adequate processing through a thorough program of education and training.

When and How to Use...

INDUCTION SOLDERING

Radio-frequency induction heating won't solve all soldering problems, but it does offer a fast and efficient method of reducing costs on high-production work

BY E. M. WHARFF, Industrial Equipt Engrg Dept WESTINGHOUSE ELECTRIC CORP

Almost any soldering job can be adapted to radio-frequency induction heating. However, there are four major factors that should be taken into consideration in making the decision.

The advantage of low unit costs can be realized only when activity is high enough to warrant the investment in fixtures or automatic handling devices, thus increasing the production per man hour. In some cases, the activity may not justify the investment for any one soldering operation, but may be sufficient if the equipment can be used for several different ones. Radio-frequency heating equipment is, in general, flexible and readily adaptable to varied work.

Materials being soldered are an important consideration. Magnetic materials, such as iron and steel, can be heated readily, perhaps three times as rapidly as copper. Copper and brass will, therefore, require higher generator ratings to achieve a heating time equal to that of steel.

Design of the parts to be joined is also important. The shape of the piece should be such that the work coil can be located close to the joint. This will heat the joint twice as fast as when the coil is at some distance.

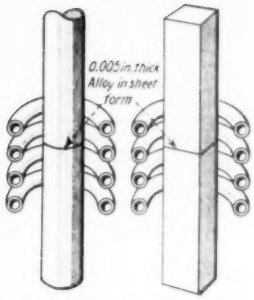
Finally, the type of solder should be studied. The lower the melting point of the solder, the less will be the power required. Therefore, it is advantageous to select the lowest melting temperature solder that will meet the mechanical requirements of the joint.

Work-Coil Design

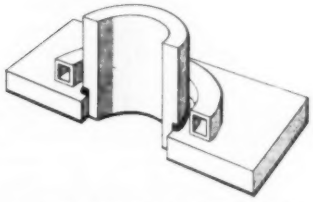
Two types of work coils are used for induction soldering; one type uses a current transformer to couple the radio-frequency power into the work and increase the current in the coil to make faster heating. Generally, this is a single-turn coil. It is usually better to use a coil of this type because: (1) It operates with low voltage and high current, and can be coupled close to the work without danger of arcing. (2) It is rugged for industrial applications and will not get out of adjustment easily. (3) Shielding is not required for radio interference or for safety precautions. (4) Heat can be localized at the joint, where it is needed.

The second type is the multi-turn coil which is connected directly to the output terminals of the R-F generator. There are some applications where a multi-turn coil can be used to better advantage, particularly when relatively heavy sections are being soldered. These require slower heating rates for the heat to penetrate to the center of the joint.

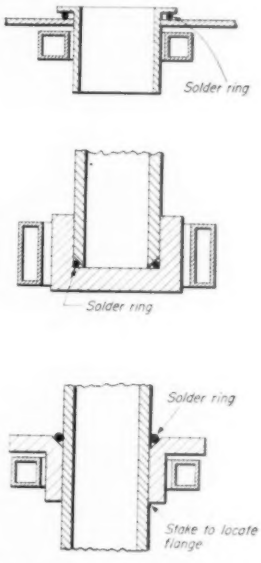
As coils with many turns have high voltages, protection should be



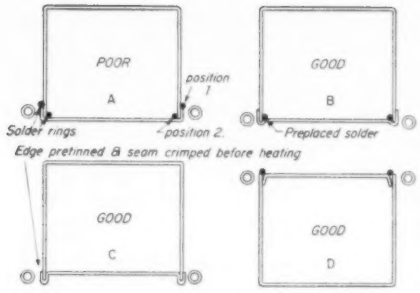
1 Applications requiring multi-turn coils. Where heavy sections are joined, slower heating is required to permit the heat to penetrate the joint



2 Single-turn coil is suitable for this type of joint. Pressure should be applied to the end of the tube to press it down into the plate when the solder melts



3 Joints of this type are well suited to induction soldering, but must rely on conduction to carry the heat to the solder ring which is shielded by the work



4 Redesign of joints is sometimes necessary for satisfactory induction soldering. *A* is suitable only for manual soldering; *B* and *C* are alternate methods for induction heating. *D* is for fillet joint on bath-tub-type capacitors

provided for the operating personnel. Clearances between the work and the coil must be great enough to prevent flash-over to the work.

To make a good joint, all surfaces to be soldered must be heated above the flow point of the solder to permit it to wet the joint properly. The coil should be designed so all parts of the joint reach the flow point of the solder as nearly as possible at the same time.

Heating a joint too fast, especially with steel, may cause one part to become overheated and oxidize, even with sufficient flux. When this happens, the operation must be halted and the part cleaned mechanically.

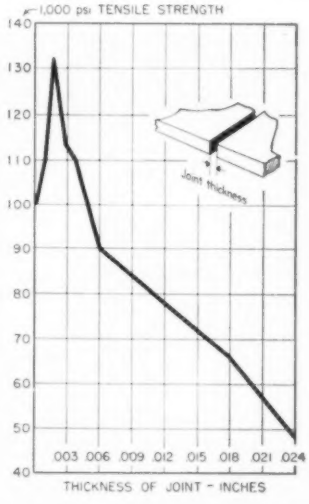
Three Types of Joints

Types of joints used for both hard and soft soldering are: (1) butt; (2) scarf; (3) lap or shear joints. Butt joints are the least desirable and should be avoided. If there is no alternative, they should be fitted carefully and held in close alignment during soldering. Scarf joints are a modified form of butt joints. In this type, planes of the surfaces to be joined form angles of less than 90° with another surface of the part. They are slightly stronger than square butt joints because of the larger contact area, and are more ductile. Lap or shear joints are the most popular type used in induction soldering. They provide a bonding area that can be changed to meet specific requirements, such as safety factor, liquid tightness, and electrical resistance. Repeated tests show that, in joining flat sheets of copper and brass, a length of lap approximately three times the thickness of the sheet will provide a joint that is stronger than the metals being joined.

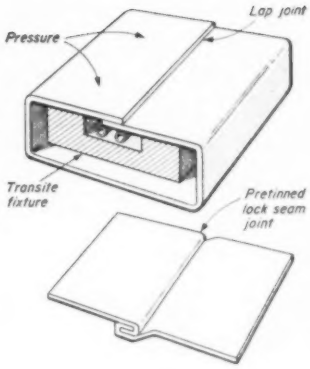
How to Design the Joint

Some applications of radio-frequency induction soldering require that the joint be redesigned. Fig. 4 (A) shows the original cover with a lap joint, designed for soldering with a soldering iron. Rosin-core solder was applied by hand.

When this design was tried with induction soldering, the percentage of good joints was only about 20%. If the solder were fed by hand, it was too slow, but there was no place to preplace it. When it was placed around the outside, position 1, some ran down the outside of the cover. That which ran into the joint, ran through and spread out



6 Tensile strength of silver-soldered joints is dependent in large measure upon the clearance between the surfaces being joined



5 Plain lap and lock-seam joints can be induction soldered. The latter are preferable because they require no fixtures and can be heated by pancake coils on a conveyor setup

over the inside surface of the cover. When a solder ring was placed inside, position 2, most of it ran over the inside surface of the cover, except at the point where the joint was close and capillary action drew it up into the joint. All of these difficulties were caused by the lack of uniformity in the joint.

The problem was solved by making a small reservoir or groove in the cover, approximately 0.020 in. deep, into which the sides of the can fitted, Fig. 4 (B). The solder was preplaced inside and the joints fluxed. When the can was heated the solder melted, filled the reservoir, and ran up between the lap joint. This increased the percentage of good joints to such an extent that induction soldering was used on production.

The crimped seam type of joint is also shown in Fig. 4 (C). In this method, the edge of the can is pretinned and fluxed, then the cover is crimped and the joint heated. In this design the solder is confined and tinning is important to give a good joint.

The type of joint used in bath-tub type condensers, Fig. 4 (D), is a good application for induction

soldering. The fits normally are tight and keep the solder in the fillet; this can be controlled by proper positioning of the area to be heated in relation to the coil.

With plain lap joints, Fig. 5, a fixture is required to hold the two faces in close contact. In this case, the sides of the joint should be tinned first and the joint fluxed, or the joint can be wiped with rosin-core solder when it has reached soldering temperature. In the lock seam, the seam is pretinned and fluxed. This type lends itself to conveyor operation, as the joint can be passed under a pancake coil and does not require a fixture to hold the parts in close contact.

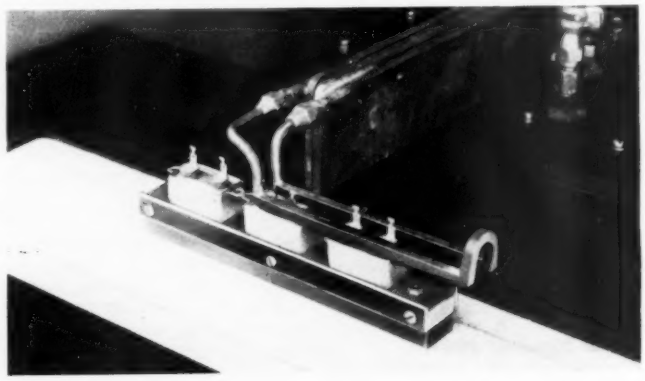
Strength of Joints

In all soldering joints, clearance is important for strength. Soft-soldered joints are used primarily for sealing, and strength is obtained mechanically, as by a lock seam. Silver-soldered joints are used because of their strength in addition to sealing. Silver alloys which, in their cast or drawn form, have a tensile strength of 40,000 to 60,000 psi, have the unique ability of making joints of still higher strength where close clearances are held. This is because the alloy diffuses into the metal of the joint and forms a new alloy of greater strength.

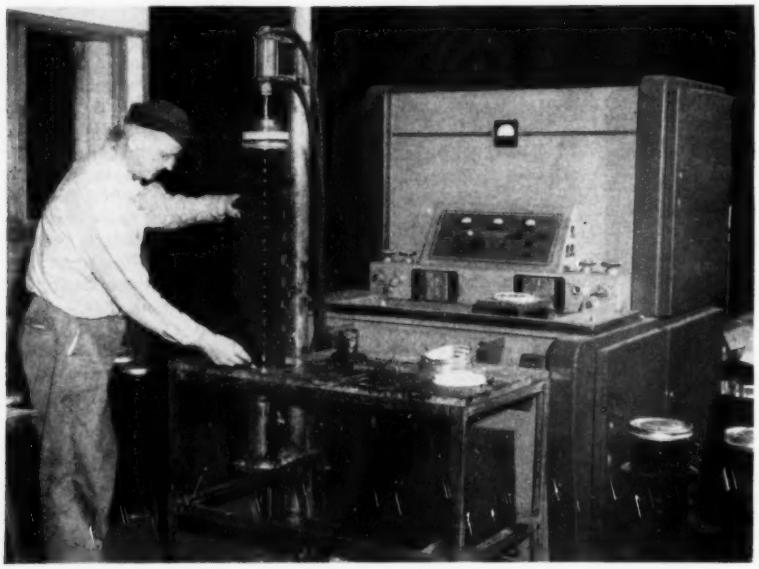
Applying the Solder

Associated closely with the design and fit of the joint is the problem of applying the solder. This is more important with the hard or silver solders because of their cost. However, silver solders are ductile and can be fabricated into a wide variety of sizes and shapes. This makes it possible to control the amount of solder used and thus eliminate waste; and to insure proper distribution of solder over joint and obtain uniform production. Moreover, it permits use of unskilled labor, assembly of parts prior to heating operations, and the making of several joints simultaneously.

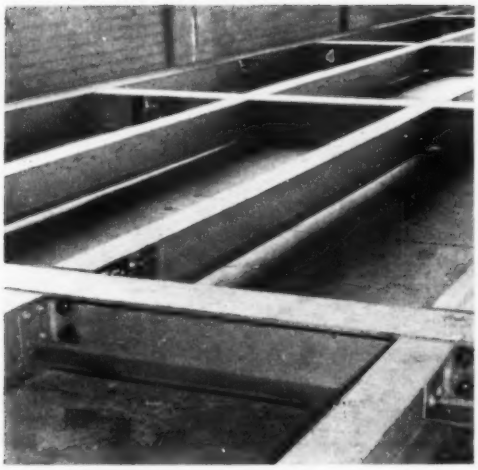
While radio-frequency induction soldering is not the answer to every problem, it is a most efficient joining method. It should be given careful consideration as a possible method of increasing output and lowering cost wherever there is high activity in light assembly work.



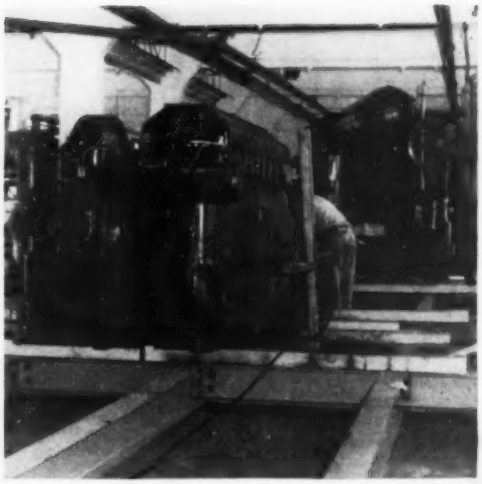
7 Setup of inductor coil and belt conveyor for induction soldering of bathtub-type capacitors



8 End plates of high-voltage insulators are induction soldered into place. Air cylinder is employed to apply pressure during heating and cooling cycle

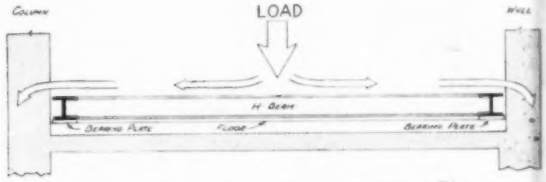


Steel gridwork bridges weak concrete flooring to spread load to main columns. Grid was partially pre-assembled by riveting, then bolted together in place



Automatic screw machine weighing 15 tons is positioned by millwrights on grid. Upper-story floor will take twice the original floor loading

◀ **Concrete pressure pad,** topped by steel bearing plate, is one of 22 which carry 176,000 lb



Load distribution is through H-beams to reinforced concrete columns along wall and at one side of the long bay

'Beefed Up' Floors Support New Tools

MOVING heavy machinery into a modern, one-story factory usually provides few difficulties. Installing the same machinery in a building erected a generation ago, on an upper floor never designed to take such a load, presents a variety of problems.

The Riverside Metal Co., Riverside, N. J., recently awarded a $2 million defense contract for artillery-fuse parts, faced this problem in moving 60 tons of equipment onto the fourth floor of a 43-yr-old wing of its Keystone Watch Case Division. The floor, designed to support only about 120 lbs per sq ft, would now have to take 250 lbs per sq ft.

Machines had to be placed to be in a row in the center of a long, narrow bay, the floor, of which was 6-in. reinforced concrete, with about 3½ in. additional cinder concrete fill. However, the brackets beside the 18-in.-dia reinforced concrete columns, which stood on 12-ft centers, would support many times the required load.

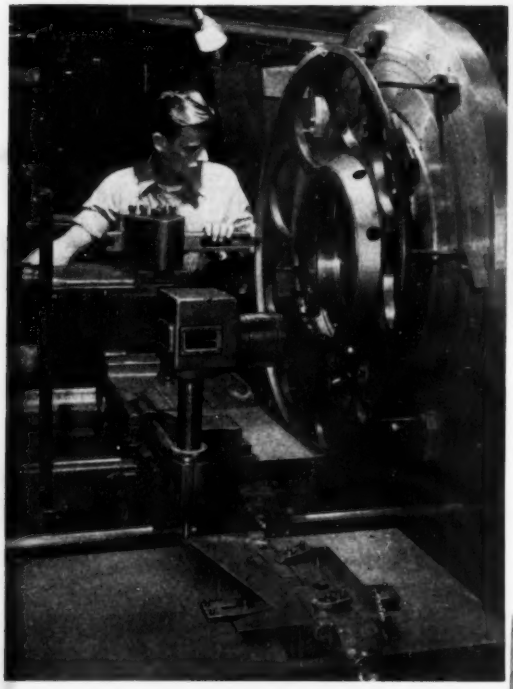
The answer lay in a method of redistributing the load to these columns by means of a shallow bridge. A grid or lattice of 8 x 8-in. structural-steel H-beams, about 2 in. clear of the floor, spanning the narrow (16-ft) bay, was used. Along both sides, on 12-ft centers coinciding with column locations, 22 concrete pressure pads were provided to receive the load.

The pressure pads, topped by 12 x 9 x 1-in. steel bearing plates, support about 8000 lbs each. The load at these points is figured to be well within the allowable limits.

Due to the absence of doors and elevators of sufficient size to accommodate the bulky new equipment, a hole had to be cut in the outer wall and the machines hoisted from the street with a mobile crane. The route from the outer wall to the grid reinforced area was strengthened by temporary timber shores, erected on the floor below. The load was here again transferred to the concrete columns by means of wooden bridging. The placing of the machines in their final locations was completed in one day without incident.

Although thorough studies must be made in each individual case, the system may prove applicable to other old, multi-story buildings. Primary factors are pillar strength, the unsupported span of floor (and consequent span of beam gridwork), and some method of getting the machines to the floor to begin with.

TALENTED ☆ TOOLING



TRACER LATHE MAKES THREE CUTS IN ONE

Combustion-chamber support ring for radial aircraft engine is turned and faced with one pass of three-plane cutting tool. Templet and follower quill of Lodge & Shipley "dual duplicator" (foreground) control electrical circuit that operates hydraulic valves to move lathe slide. Work is clamped on 48-in. forged-aluminum faceplate, and is supported at edges by eight rods—providing 0.003-in. accuracy. *Pratt & Whitney Aircraft.*

TURRETED CARRIAGE STOPS SAVE ENGINE-LATHE TIME

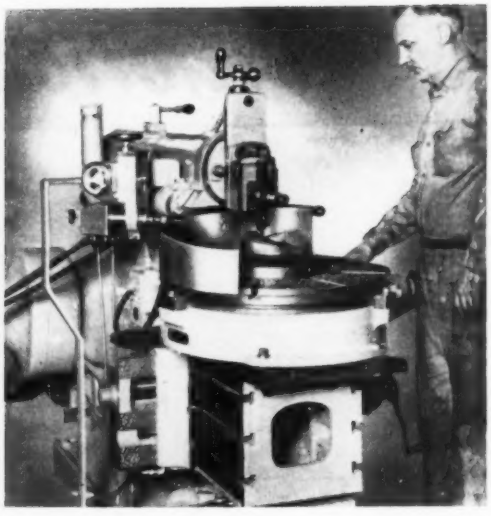
Multiple-return settings are made quickly on engine lathes with six-hole stop plate that takes rods of various lengths. Idea was suggested by turret-lathe stops; was fabricated and applied to most engine lathes in Northrop's Hawthorne, Calif., shops. Rods are fixed with stopnuts, but may be shifted or replaced. Way stop on lathe head has micrometer adjustment. *Northrop Aircraft, Inc.*

PORTABLE DRILL WORKS WITH SIX-SPINDLE CYCLE

Centerhole is countersunk in threaded steel plug while six-spindle Commander cuts lengthwise holes in other plugs in progressive cycle—three at each position, two positions. Drill is clamped to bracket on side of drill-press. Air-indexed table has locating plate; carries parts progressively under portable drill and multiple-drill spindles. Parts are later inverted so holes in opposite ends can be drilled. Only manual work is loading and unloading. *Manufacturing Div., Motorola, Inc.*

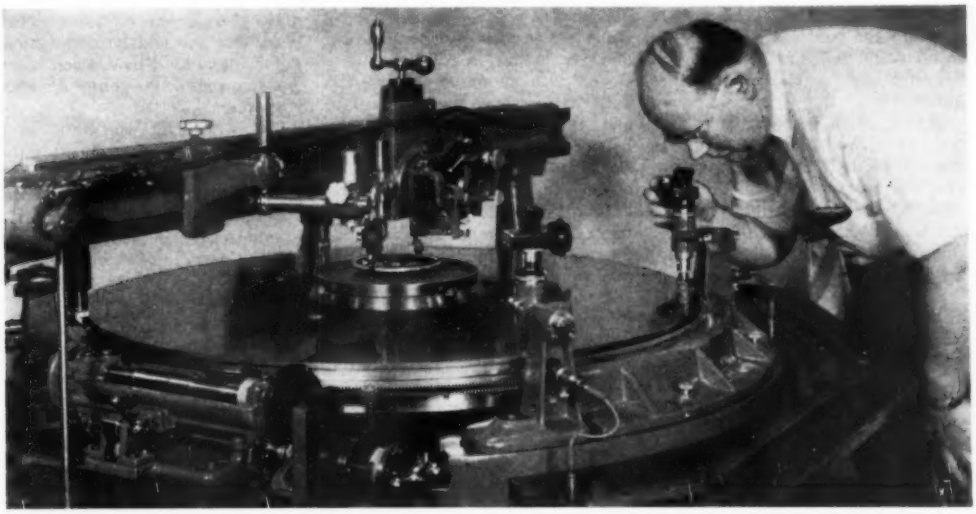
ABRASIVE STROPPING FINISHES TURBINE BLADES

Endless-belt abrasive grinder smooths blade forgings for turbojet and turboprop aircraft by either finishing them after rough grinding, or by grinding them completely from raw forgings. Equipment (rear) is similar to propeller-grinding belt machines developed during war; can take off 3/32 in. of metal in 15 min. Operator here checks blade contours with templet gage. *Hamilton Standard Div., United Aircraft Corp.*



HYDRAULIC SHAPER DUPLICATOR COPIES BRAKE TEMPLET

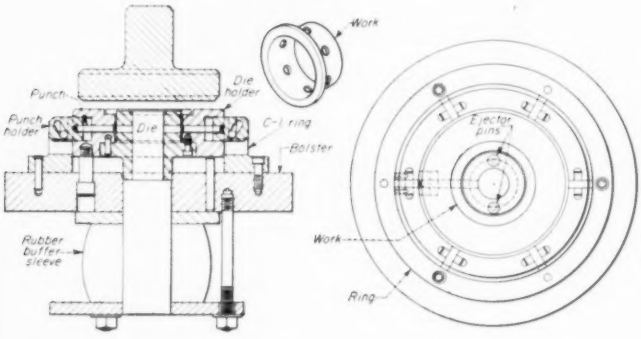
Special rotary table and Turchan duplicator added to 24-in. shaper help cut interchangeable mating sections of brake mechanisms for overhead cranes. Sheet-metal templet is attached to table edge; may be cheaply made to almost any contour. Stylus projecting over templet operates hydraulic valve on cylinder that raises or lowers table as table rotates. Templet follower also has pump and motor in hydraulic circuit. *Cincinnati Shaper Co.*



"FLOATING" DIVIDING ENGINES CHECK TRANSITS

Precision to within less than a second of arc is maintained for two Swiss dividing engines by special mounts. The machines, made by S. I. P., rest on concrete blocks, which are supported by coiled springs to isolate vibrations. Platen on each machine has 720 teeth on its OD, and is adjusted by single-thread worm. Compensating devices built into base correct for tooth irregularities. *W & L E Gurley.*

Practical Ideas



Six Side-Cutting Punches Pierce Beaded Sleeve

AFTER DRAWING AND BEADING operations on the illustrated sleeve workpiece, six holes had to be punched through the wall. Drilling was inefficient—and because the stock was thin, would have been troublesome. An indexing die would have worked, but was considered too expensive. The gadget that did the job was a set of six side-cutting punches in a die set operated by a blunt, cast-iron punch.

A die with six radial holes through it was mounted inside a die holder—both parts being cut to nest the workpiece. The die was shouldered at the bottom to fit into the bolster hole, which kept the slugs from jamming between the die plates.

Six round punches were fitted into six round holders that were flatted on two sides to fit into milled slots in the die holder. This fit was close so the punches could not be broken off by slight misalignment or twisting of the die or die holder.

Each punch holder was slotted at an angle of 60° to the horizontal to take a pin set in the cast-iron ring that fitted around the die holder. The only function of the ring was to hold these pins steady so they would force the punch holders radially inward as the ram descended—thus cutting the holes in the work.

Bolts and dowels, of course, held the die to the die holder, and the cast-iron ring to the bolster. The die holder rode vertically inside the ring with a minimum of necessary clearance.

Instead of spring-loading the die and its holder, a rubber buffer sleeve was mounted below the bolster. This was held by a plate and three long bolts from the bolster. A cast-iron plate above the sleeve took pressure from three dowel pins that bore against the bottom of the die holder; so when the ram was depressed and the die and its holder dropped, the pins would push down on the plate and rubber sleeve. After the ram started up again, the rubber sleeve would expand to normal shape again, forcing the plate and three pins up, and returning the die holder to its original position. Three socket-head capscrews assembled through holes in the bolster and into holes in the die holder limited this motion so it would not be excessive.

Two spring-loaded ejector rods were located in the die below the work to raise each workpiece after it was punched; allowing removal by hand or by air blast. These, of course, compressed as the ram came down. *N. Bonamini, Glasgow, Scotland.*

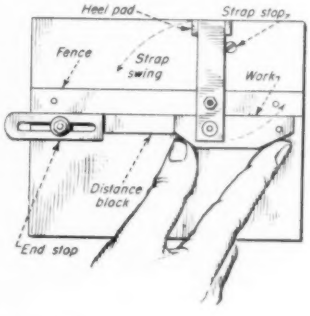
Center-Distance Jig Spaces Holes

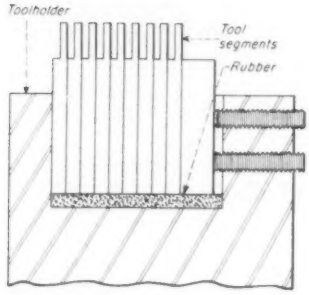
WHEN WE HAD TO DRILL several hundred links at various center distances, we devised this adjustable jig. It has an adjustable end stop, and is equipped with a distance block to space the work so the second hole will be located properly.

Each different size of workpiece was first laid out; then, with the drill-bushing strap swung out of the way, was drilled by locating it visually. With the right-hand hole under the drill, the end strap was butted against the link and tightened. Then, with the left-hand hole under the drill, a distance block was cut and fitted between the stop and the link.

With the bushing back in place, the operator simply located the work against the stop for the first hole, then dropped the distance block in place and located against it for the second hole. Each block was marked for the center distance it spanned.

The whole rig was built on a plate base bolted or clamped to the drill table. The bushing strap was screwed down to the strap fence, and its rear end was nested in a channel-cut heel pad, to prevent shifting. *Ian J. Peacock, Ainstable, England.*

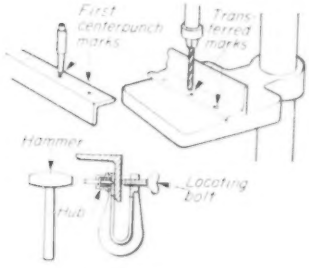




Rubber Backs Tool Inserts

PROPER SETTING and adjustment of inserted-blade or form tools in toolholders is often difficult and laborious. When the forms or sections are numerous and narrow, the setting must be done accurately. A rubber pad under or behind these bits makes the job a lot easier.

The pad may be a block of rubber (not too thick), or even a number of rubber bands. It allows clamping the tools nearly tight enough, then tapping one or two which are out of line without disturbing the others. *O. C. Steffens, St. Louis, Mo.*

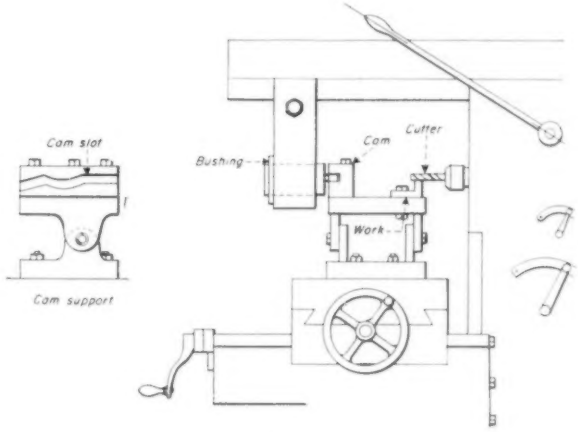


Centerpunch Marker Transfers Layout Spots

RIVET, BOLT, AND REFERENCE holes to be drilled in structural shapes, like angle iron, are often laid out on one side of the work, then drilled through from the other side. It's a matter of convenience. But transferring the layout mark is not always convenient.

A centerpunch-transferring device can be made with a section of ribbed U-iron. One jaw is drilled and tapped to take a hardened, pointed bolt. The other end is fitted with a hub that holds a similar pointed bolt that is spring-loaded. The hole through this jaw should be small enough to confine the bolt, yet counterbored to let it project slightly.

After a centerpunch mark is made, the U is slipped over the edge of the work, the spring-loaded bolt allowed to catch in the centerpunch mark, and the other bolt is tightened to mark the other side of the work. *Robert Laimbock, Innsbruck, Austria.*



Tilting-Base Mill Fixture Sets Up Contour Jobs

SLOTS AND EDGE CONTOURS, to be milled to a layout form, are cut with a milling fixture that is not solidly supported. The machine has a regular overarm fitted with a tight bushing that holds a small roller. This is the same size as the cutter and the same size as the slot form cut along the cam block, and it controls the fixture to produce the contour on the work.

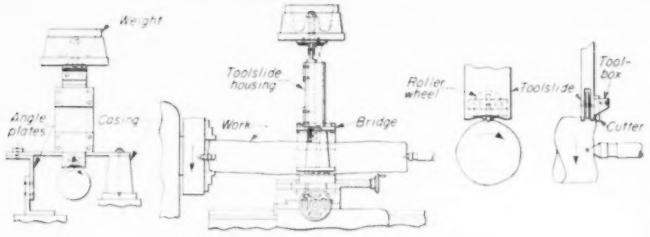
Bolted to the machine table, the fixture base consists of a two-lobe angle plate. A second two-lobe angle plate is above this, and the two are joined by pivot bolts through the lobes. The structure permits a tilting, rocking action that permits the fixture to raise and lower the work to follow the cam shape.

The cam is a form-milled block at the left side of the top plate, mounted so the roller attached to the overarm will work in the cam slot. At the right side of the plate, the work is clamped or bolted to correspond to the cam, with its vertical position maintained so the cutting will be done to the required depth.

First, the table must be raised so the roller will enter the slot as the table traverses. For this operation, clamps on the pivot bolts are tightened, but they are released as soon as the roller is in the cam slot.

As the table traverses, the roller will force the tilting plate (through the cam slot) to tilt back and forth, presenting the surface of the work to the cutter so it will mill the same form.

For best results, climb milling is done to keep the roller in best contact with the slot. Because the amount of permissible tilt is limited, only cam forms with not too much vertical variation should be cut this way. *Allan Clarke, Rochdale, England.*



Copying Lathe Made From Standard Toolroom Machine

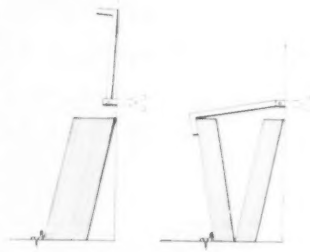
SURFACE DEFECTS and impurities had to be removed from heavy, forged drums; and although the surfaces were irregular and as much as $1\frac{3}{4}$ in. out of true along their 8-ft lengths, instructions called for a cut across the surface of a uniform $\frac{3}{8}$-in. depth. The equipment we added to an engine lathe to do this job was mainly borrowed and improvised.

To avoid the use of heavy springs that would make the tool follow the original contour while it cut the new one, we mounted the toolslide vertically; supported on the lathe carriage by a couple of handy angle plates and a cast-off gear casing. A stock piece of heavy steel was the bridge over these parts, and on this was mounted, by bolting it firmly with angle plates, a cast-iron toolslide housing borrowed from a tapering arrangement on a heavy center lathe.

The toolslide itself was the only specially made part of the attachment. The top end was fitted with small angle plates, and the lower end was slotted and fitted with a roller wheel as shown. A mild-steel toolbox to position the single-point cutter was welded and bolted to the side of the toolslide, in line with the roller. The underside of this toolbox was form-cut to clear chips.

On the top of the toolslide, a heavy weight, borrowed from the maintenance department, was fastened to the angle plates. This provided plenty of force to hold the tool down against the work.

To make the cutter follow the roller and form of the roll closely, the distance between the roller and toolbit was kept small. There was some lag, but not too much. With the work centered, the cut was made from tailstock to headstock. A hand jack was located between the top of the toolslide housing and the weight to allow traversing the carriage back to the tailstock end for the second cut. *G. D. Mackinnon, Airdrie, Scotland.*



Sheet-Metal Stacker Clamps to Wall

HEAVY SHEETS of flat stock too large to conveniently lift onto a shelf can be stored against a wall with this simple device. The stack-holder prevents many accidents and keeps the stock neatly in order.

A fitting or bolt is driven through the wall to pivot a rigid L-shaped arm that holds the stock. The pivot should be raised above the stack of sheets sufficiently to allow clearance; and the L of the arm should be cut to hold the sheets, when dropped against the arm, so they will not shift or fall outward.

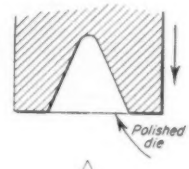
The device allows a shop man to swing out part of the stack, catching it with the arm, and to select any particular sheet he wants. *Robert Laimbock, Innsbruck, Austria.*

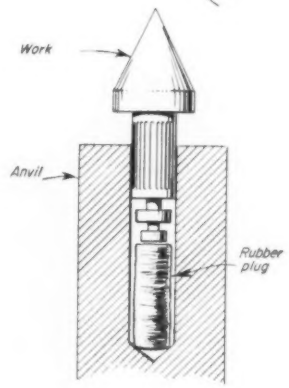
Coining Die Bypasses Second Lathe Operation

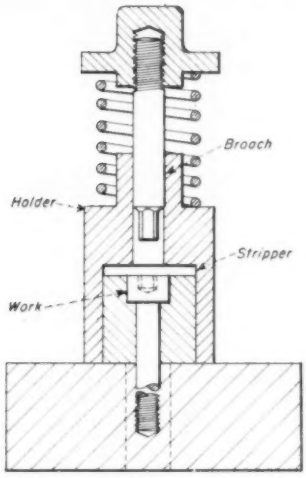
A DESIGN CHANGE on a brass part, made on screw machines, called for a perfectly blended radiused nose, instead of a sharp-pointed nose. It looked at first like a tedious second operation; but we thought up a kick-press die that did the job in jig time.

The die was cut and ground to the perfectly blended shape, then highly polished. The workholder, located on the press table, was a simple drilled bar with a loose-fitting rubber plug in the bottom to partly eject the work so it could be easily picked out of the holder. As the die descended with the ram, it forced the part down so the shoulder stopped on the lip of the bar. The die coined the work perfectly.

Thus, we avoided chucking the work on the knurled area. *Robert Roeder, Berwyn, Pa.*







Arbor-Press Adapter Takes Broaching Cutters

A NUMBER of different shapes and sizes of broaches can be inserted in this simple holder to allow broaching with a conventional bench arbor press. The only changes necessary to switch from one job to another are to switch broaching cutters and work nests.

The base is a machined steel ring with a centerhole to pass the work, if necessary. On top of this, a die-holding and broach-guiding block is mounted. A compression spring works between the top on this guide and the flanged cap to return the broach to the "up" position after a stroke.

To allow inserting a workpiece and removing it after the stroke, the guide is not attached to the base; but it may be located in a recess to prevent any shifting. *J. C. Kaiser, Newark, N. J.*

Shaper Clamp Blocks Grip Large Work

WHEN SHAPER or milling-machine work is to be machined all over the top, and there are no shoulders or projections on which to seat clamps, here is a possible way to clamp it:

Take steel blocks, 4 by 2 by ½ in., drill a bolt-clearance hole through the center of each (perpendicular to the large, flat side), then turn one end of each block down to about a ½-in. dia for a 1½-in. length. Now you have blocks with pins at the ends.

Drill holes straight into the work to clear these pin ends—making the holes parallel to the top of the work. Locate the work, insert the clamps, and bolt them down into T-slots. *Frank M. Butrick, Alma, Mich.*

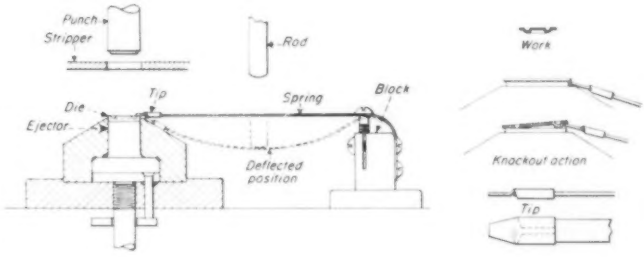
Old Bearing Races Gage Bores

ON OUR HORIZONTAL MILLS, we cut bearing holes with boring bars supported between centers. Naturally, we cannot remove the bars easily to allow measuring the holes with plug gages; and calipers are not accurate enough on many jobs.

Therefore, we obtained a series of used bearings, disassembled them, and took the outer races. These were measured and marked with an electric needle. In almost all cases we could find one that was already about the right dimension on the OD to gage our work on bearings.

A step, a quarter the length of the bearing depth, was ground 0.001 in. smaller than the original OD on each bearing race. Thus, the original OD would act as an outer limit, and the step as an inner limit for the dimension.

Such a gage is slipped over the boring bar when setup is made, and can be advanced into the bore each time a check is wanted. When not in use, the gage can be held back away from the work with a wire or piece of tape. *Charles H. Johnson, Madison, Wis.*



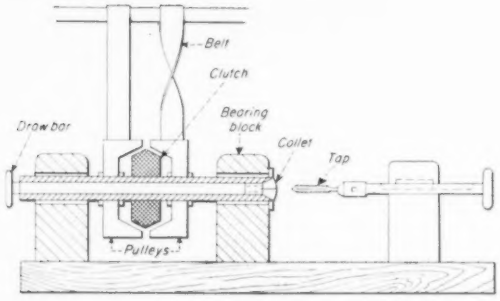
Spring Knockout Works Outside Die

HAVING A NUMBER of aluminum disks to be blanked and ringed from stock, we made a simple die and punch to do the work. With the current shortage of materials, however, we had to economize on the work ejector. This one, made from an old piece of spring stock, works completely outside the die.

The right end of the spring is fixed on a block on the press table. Attached to the ram of the press is a rounded rod which will deflect the spring as the ram drops to force the punch into the stock. The left-hand end of the spring projects slightly past the edge of the die, and is fitted with a tip that can get under the lip of the punched blank when it rises.

As the ram drops, the spring is deflected and the tip is forced down the side of the die, which slopes. When the ram starts up again, the spring starts to straighten, the tip comes up along the die, and the tip snaps under the work. This continues as the ram raises until finally the spring pressure forces the work up out of the die and flings it to the left.

The operation of the knockout is automatic, once it is adjusted and located properly. The knockout is not foolproof, but, if properly adjusted, should work every time as long as the tip is in good shape. *Haim Murro, Jerusalem, Israel.*

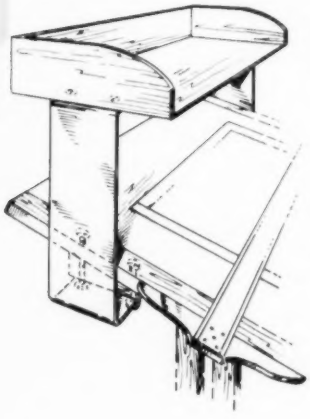


Tapping Machine Made With Friction Drive

HAVING SOME TAPPING work to do, we decided to make a small, cheap tapping machine from readily available scrap parts in the shop. Two bearing blocks were mounted on a bench, and two free-wheeling pulley sheaves were mounted on a spindle between the blocks.

The pulleys were driven from an overhead shaft; one straight-belted, and one cross-belted so they drove in opposite directions. A taper-turned drive block, keyed to the spindle, rode between the bored pulleys, where it could be pushed forward or back to engage either pulley by shifting the spindle in its bearings.

A third bearing block held a keyed tailstock spindle fitted with a chuck to take the tap. Work was gripped in a small collet in the headstock spindle, and was controlled by a drawbar. The tap was chucked to the tailstock spindle, which slid in its block. When the tap was advanced to the left, it forced the headstock spindle back, causing the driving block to engage the rear pulley. This drove the spindle counterclockwise. When full depth was reached, the tap spindle was pulled, which engaged the block with the forward pulley, rotating the spindle clockwise and permitting the tap to withdraw from the work. *R. G. Vare, Christchurch, England.*



Tool-Design Shelf Holds Equipment Handy

THIS SHELF, made for a cost of under $15.00, holds drafting equipment at a convenient height to improve drafting efficiency. The wooden shelf is supported from the two angle blocks under the drafting board by bent metal straps.

Most draftsmen hardly ever change the angle of their board, once it is set, so this design is not adjustable — although it could easily be made so. Two small tapered wood blocks under the board permit the shelf to be made level. *H. C. Urbauer, Freeport, L. I., N. Y.*

$25 *In addition to regular payment*

for the best PRACTICAL IDEA

An extra payment of $25 will be made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

PAYMENT—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of the issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES — A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

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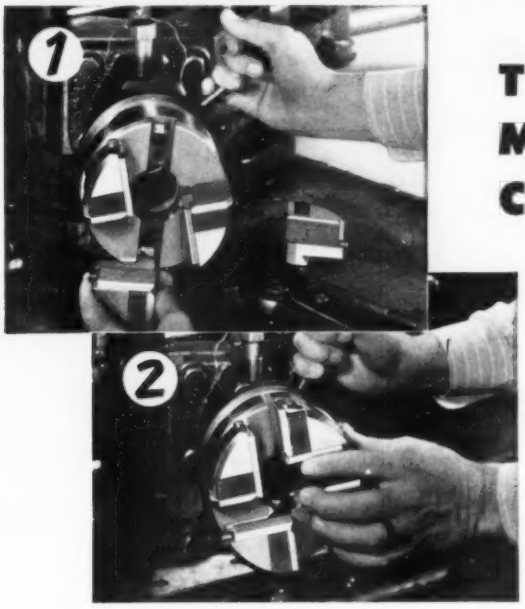
HOW TO ENTER—Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42d St., New York 18, N.Y.

131st Winner:
(For June 25)

Ian J. Peacock
Bolt-Holding Fixture
Allows Milling Shanks

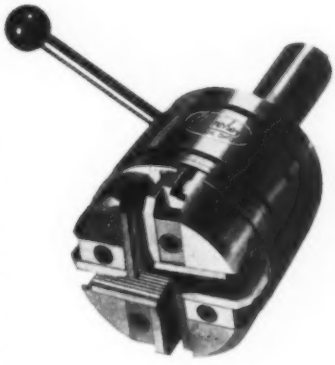
JUST ONE MINUTE



TO CHANGE MURCHEY CHASERS

1. Simply remove stop collar—take out chaser and holding block assemblies.

2. Insert blocks with sharpened chasers against positive locators —replace stop collar.



WHAT A TIME-SAVER—Downtime for changing chasers on other makes of tangent dieheads is from 15 minutes to one hour. *Only one minute is required to change over Murchey chasers on the job.*

WHAT A SETUP-SAVER—Machine operators change their own Murchey chasers which are already precisely pre-set in the holding blocks.

WHAT A CHASER-SAVER—By means of the Murchey tangent setting fixture, only a touchup grinding wheel cut is required to resharpen—a bare minimum stock is removed. Also, each chaser is positioned to take its full share of the cutting load.

WHAT A MONEY-SAVER—With Murchey chasers, the machine is down for change-over only, 1/15 to 1/60 of conventional change-over time. Setup is done separately by unskilled help when time permits. Murchey chasers wear longer.

5717

Write, wire, or phone for a Murchey "quick change-over" demonstration.

Lower Cost per Thread

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SHEFFIELD CORPORATION

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How "PH" Stainless Steels COMBINE 4 ADVANTAGES

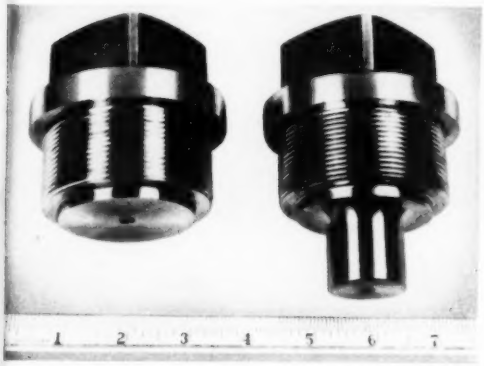
Here are two Armco Stainless Steels that combine excellent corrosion resistance, high strengths and hardnesses with low-temperature heat treatments.

They are known as Armco 17-7 PH and Armco 17-4 PH.

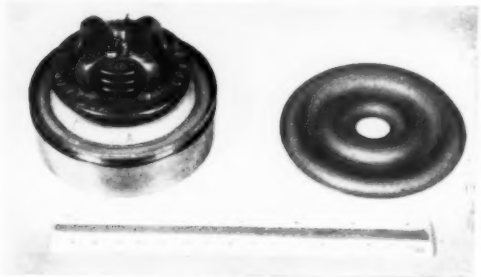
These precipitation-hardening chromium-nickel types offer many new opportunities for the use of stainless steel, and are improved materials for many applications where standard stainless types are now used.

Depending upon condition supplied and subsequent heat treatment, Armco 17-7 PH sheets attain yield strengths of 150,000 to 250,000 psi and hardnesses up to Rockwell C50.

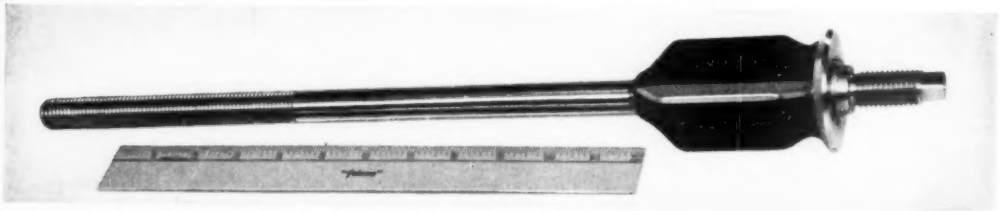
This anti-shimmy damper is one of the 13 production parts of Armco 17-4 PH bar stock used on AJ-1 and B-45 airplanes.



Armco 17-4 PH Stainless Steel bars are used for these valve plugs designed for pump heads in a chemical plant. Plugs are exposed to a solution of basic chromium sulfate at pressures ranging up to 7500 psi. Perfect threads are a "must."



For the best combination of high hardness and corrosion resistance, Armco 17-7 PH strip was chosen for the valve disc of this all-metal pump valve assembly.



Safety valve stem for liquefied petroleum gas tank made of Armco 17-4 PH. This part is upset and forged from bar stock, annealed and machined. Low-temperature heat treatment develops high yield strength without distortion.

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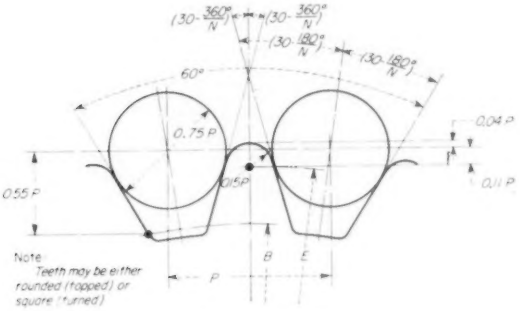
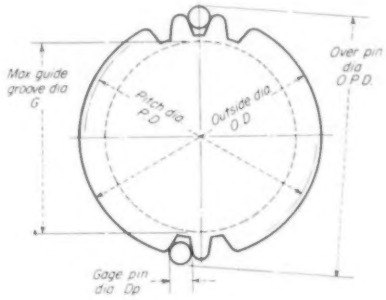
American Machinist

Sprockets for Silent Chains..I

Abstracted from American Standard ASA B29.2—1950, entitled "Inverted Tooth (Silent) Chains and Sprocket Teeth." Published by the Society of Automotive Engineers, 29 West 39th St., New York 18. Price to non-members, $2.



SPROCKET TOOTH FORM



SPROCKET DIAMETERS

Elements of Sprockets

P = Chain pitch
PD = Pitch dia
OD = Outside dia
D_p = Gage-pin dia
E = Dia to center of topping curve
B = Dia to base of working face
OPD = Over-pin dia
G = Max guide-groove dia
N = Number of teeth

Formula for Sprockets

$$PD = P \div \sin 180°/N$$
$$D_p = 0.625P$$
$$E = P(\cot 180°/N - 0.22)$$
$$B = P\sqrt{1.5152 + (\cot 180°/N - 1.1)^2}$$

For even teeth:
$$OPD = PD - 0.125P \csc (30 - 180/N)° + 0.625P$$

For odd teeth:
$$OPD = \cos 90°/N\,[PD - 0.125P \csc (30 - 180/N)°] + 0.625P$$

For rounded teeth:
$$OD = P(\cot 180°/N + 0.08)$$

For square teeth:
$$OD = 2\sqrt{X^2 + L^2 - 2XL\cos a}$$

Where $X = Y \cos a - \sqrt{(0.15P)^2 - (Y \sin a)^2}$
$Y = P(0.500 - 0.375 \sec a)\cot a + 0.11P$
$L = Y + E/2$
$a = (30 - 360/N)°$
$G\ (\max) = P(\cot 180°/N - 1.16)$

Formula for Maximum Hub Diameters

For hobbed teeth:
$MHD = P(\cot 180°/N - 1.33)$

For straddle-cut teeth:
$MHD = P(\cot 180°/N - 1.25)$

OVER-PIN DIAMETER TOLERANCES* • *All tolerances are negative. Tolerance* $= (0.004 + 0.001P\sqrt{N})$

PITCH	Up to 15	16-24	25-35	36-48	49-63	64-80	81-99	100-120	121-143	144 up
3/8	0.005	0.005	0.005	0.006	0.006	0.007	0.007	0.007	0.008	0.008
1/2	0.005	0.006	0.006	0.007	0.007	0.008	0.008	0.009	0.009	0.010
5/8	0.006	0.006	0.007	0.008	0.009	0.010	0.010	0.010	0.011	0.012
3/4	0.006	0.007	0.008	0.009	0.010	0.011	0.011	0.012	0.013	0.014
1	0.007	0.008	0.009	0.010	0.011	0.012	0.013	0.014	0.015	0.016
1-1/4	0.008	0.009	0.010	0.011	0.013	0.014	0.015	0.017	0.018	0.019
1-1/2	0.008	0.010	0.011	0.013	0.014	0.016	0.017	0.019	0.020	0.022
2	0.010	0.012	0.014	0.016	0.018	0.020	0.022	0.024	0.026	0.028

* *Tolerances for OD of sprocket with square-top teeth = plus 0.000; min 0.050P.*
Tolerance for maximum eccentricity of pitch diameter with respect to the bore = 0.001 PD, but not less than 0.006 or more than 0.032 in.

ELIMINATE MOTOR FAILURE with class (H) insulation made with DOW CORNING SILICONES

Wet Motors

are a constant threat to your production schedules . . . unless they're wound with Dow Corning Silicone (Class H) insulation. Here's evidence of the fact that Class H has at least 10 times the wet insulation resistance of the next best class of insulating materials. At Virginia-Carolina Chemical Corporation's Homewood mine, a 300 hp., silicone insulated motor was back in service 3 hours after flooding with mud and waste water. Under the same conditions, an identical Class B motor had to be reworked and rebaked. Similar experience over the past 5 years has persuaded many chemical companies to specify Class H exclusively for all condensate and centrifugal pump motors.

Hot Motors

die young . . . unless they're protected with Dow Corning Silicone (Class H) insulation. Here's evidence of the fact that Class H insulation makes hot and hard working motors last 10 times longer than they ever did before. Silicone insulated spinner bucket motors in rayon mills last 6 to 24 times as long as Class A motors. Silicone insulation makes the high speed, rapidly reversing motors used by Cogsdill Twist Drill Company last 12 to 100 times as long as Class A or Class B motors. In a large steel mill, a crane hoist motor had 4 to 42 times the life of a Class B motor.

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Write today for list of Class H motor manufacturers or listing of Class H rewind shops now located in all major industrial centers.

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Sprockets for Silent Chains..II

Standard Diameters of Sprockets, 1-in. Pitch, 0.625 In. Gage Pin
For other pitches—3/8 in. and larger—multiply these values by pitch

No. Teeth	Pitch Diameter	Outside Diameter: Rounded* Teeth	Outside Diameter: Squared△ Teeth	Over-Pin Dia.	Max. Guide Groove Dia.
17	5.442	5.429	5.298	5.669	4.189
18	5.759	5.731	5.623	6.018	4.511
19	6.076	6.072	5.947	6.324	4.832
20	6.393	6.393	6.271	6.669	5.153
21	6.710	6.714	6.595	6.974	5.474
22	7.027	7.036	6.919	7.315	5.796
23	7.344	7.356	7.243	7.621	6.116
24	7.661	7.675	7.568	7.960	6.435
25	7.979	7.996	7.890	8.266	6.756
26	8.296	8.315	8.213	8.602	7.075
27	8.614	8.636	8.536	8.909	7.396
28	8.932	8.956	8.859	9.244	7.716
29	9.249	9.275	9.181	9.551	8.035
30	9.567	9.595	9.504	9.884	8.355
31	9.885	9.913	9.828	10.192	8.673
32	10.202	10.233	10.150	10.524	8.993
33	10.520	10.553	10.471	10.833	9.313
34	10.838	10.872	10.793	11.164	9.632
35	11.156	11.191	11.115	11.472	9.951
36	11.474	11.510	11.437	11.803	10.270
37	11.792	11.829	11.757	12.112	10.589
38	12.110	12.149	12.077	12.442	10.909
39	12.428	12.468	12.397	12.751	11.228
40	12.746	12.787	12.717	13.080	11.547
41	13.064	13.106	13.037	13.390	11.866
42	13.382	13.425	13.357	13.718	12.185
43	13.700	13.743	13.677	14.028	12.503
44	14.018	14.062	13.997	14.356	12.822
45	14.336	14.381	14.317	14.667	13.141
46	14.654	14.700	14.637	14.994	13.460
47	14.972	15.018	14.957	15.305	13.778
48	15.290	15.337	15.277	15.622	14.097
49	15.608	15.656	15.597	15.943	14.416
50	15.926	15.975	15.917	16.270	14.735
51	16.244	16.293	16.236	16.581	15.053
52	16.562	16.612	16.556	16.907	15.372
53	16.880	16.930	16.876	17.218	15.690
54	17.198	17.249	17.196	17.544	16.009
55	17.517	17.568	17.515	17.857	16.328
56	17.835	17.887	17.834	18.183	16.647
57	18.153	18.205	18.154	18.494	16.965
58	18.471	18.524	18.473	18.820	17.284
59	18.789	18.842	18.793	19.131	17.602
60	19.107	19.161	19.112	19.457	17.921
61	19.426	19.480	19.431	19.769	18.240
62	19.744	19.799	19.750	20.095	18.559
63	20.062	20.117	20.070	20.407	18.877
64	20.380	20.435	20.388	20.731	19.195
65	20.698	20.754	20.708	21.044	19.514
66	21.016	21.072	21.027	21.368	19.832
67	21.335	21.391	21.346	21.682	20.151
68	21.653	21.710	21.665	22.006	20.470
69	21.971	22.028	21.984	22.319	20.788
70	22.289	22.347	22.303	22.643	21.107
71	22.607	22.665	22.622	22.955	21.425
72	22.926	22.984	22.941	23.280	21.744
73	23.244	23.302	23.259	23.593	22.062
74	23.562	23.621	23.578	23.917	22.381
75	23.880	23.939	23.897	24.230	22.699
76	24.198	24.257	24.216	24.553	23.017
77	24.517	24.577	24.535	24.868	23.337
78	24.835	24.895	24.853	25.191	23.655
79	25.153	25.213	25.172	25.504	23.973
80	25.471	25.531	25.491	25.828	24.291
81	25.790	25.851	25.809	26.141	24.611
82	26.108	26.160	26.128	26.465	24.929
83	26.426	26.487	26.447	26.778	25.247
84	26.744	26.805	26.766	27.101	25.565

No. Teeth	Pitch Diameter	Outside Diameter: Rounded* Teeth	Outside Diameter: Squared△ Teeth	Over-Pin Dia.	Max. Guide Groove Dia.
85	27.063	27.125	27.084	27.415	25.885
86	27.381	27.443	27.403	27.739	26.203
87	27.699	27.761	27.722	28.052	26.521
88	28.017	28.079	28.040	28.375	26.839
89	28.335	28.397	28.359	28.689	27.157
90	28.654	28.716	28.678	29.013	27.476
91	28.972	29.035	28.997	29.327	27.795
92	29.290	29.353	29.315	29.649	28.113
93	29.608	29.671	29.634	29.963	28.431
94	29.926	29.989	29.953	30.285	28.749
95	30.245	30.308	30.271	30.001	29.068
96	30.563	30.627	30.590	30.923	29.387
97	30.881	30.945	30.909	31.237	29.705
98	31.199	31.263	31.228	31.559	30.023
99	31.518	31.582	31.546	31.874	30.342
100	31.836	31.900	31.865	32.196	30.660
101	32.154	32.218	32.183	32.511	30.978
102	32.473	32.537	32.502	32.834	31.297
103	32.791	32.856	32.820	33.148	31.616
104	33.109	33.174	33.139	33.470	31.934
105	33.427	33.492	33.457	33.784	32.252
106	33.746	33.811	33.776	34.107	32.571
107	34.064	34.129	34.094	34.422	32.889
108	34.382	34.447	34.413	34.744	33.207
109	34.701	34.767	34.731	35.059	33.527
110	35.019	35.084	35.050	35.381	33.844
111	35.337	35.403	35.368	35.695	34.163
112	35.655	35.721	35.687	36.017	34.481
113	35.974	36.040	36.005	36.333	34.800
114	36.292	36.358	36.324	36.654	35.118
115	36.610	36.676	36.642	36.969	35.436
116	36.929	36.995	36.961	37.292	35.755
117	37.247	37.313	37.279	37.606	36.073
118	37.565	37.632	37.598	37.928	36.392
119	37.883	37.950	37.916	38.243	36.710
120	38.201	38.268	38.235	38.564	37.028
121	38.519	38.586	38.553	38.879	37.346
122	38.837	38.904	38.872	39.200	37.664
123	39.156	39.223	39.190	39.516	37.983
124	39.475	39.542	39.508	39.839	38.302
125	39.794	39.861	39.827	40.154	38.621
126	40.112	40.180	40.145	40.476	38.940
127	40.430	40.497	40.464	40.790	39.257
128	40.748	40.816	40.782	41.112	39.576
129	41.066	41.134	41.100	41.427	39.894
130	41.384	41.452	41.419	41.748	40.212
131	41.702	41.770	41.738	42.063	40.530
132	42.020	42.088	42.056	42.384	40.848
133	42.338	42.406	42.374	42.699	41.166
134	42.656	42.724	42.693	43.020	41.484
135	42.975	43.043	43.011	43.336	41.803
136	43.293	43.362	43.329	43.657	42.122
137	43.611	43.679	43.647	43.972	42.439
138	43.930	43.998	43.966	44.295	42.758
139	44.249	44.317	44.284	44.611	43.077
140	44.567	44.636	44.603	44.932	43.396
141	44.885	44.954	44.922	45.247	43.714
142	45.203	45.271	45.240	45.568	44.031
143	45.521	45.590	45.558	45.883	44.350
144	45.840	45.909	45.877	46.205	44.669
145	46.158	46.227	46.195	46.520	44.987
146	46.477	46.546	46.514	46.842	45.306
147	46.796	46.865	46.832	47.159	45.625
148	47.114	47.183	47.151	47.479	45.943
149	47.432	47.501	47.469	47.795	46.261
150	47.750	47.819	47.787	48.116	46.579

• Blank diameters shall be 0.020 larger than finished diameters tabulated above.
△ Diameters given are maximum; all tolerances must be negative.

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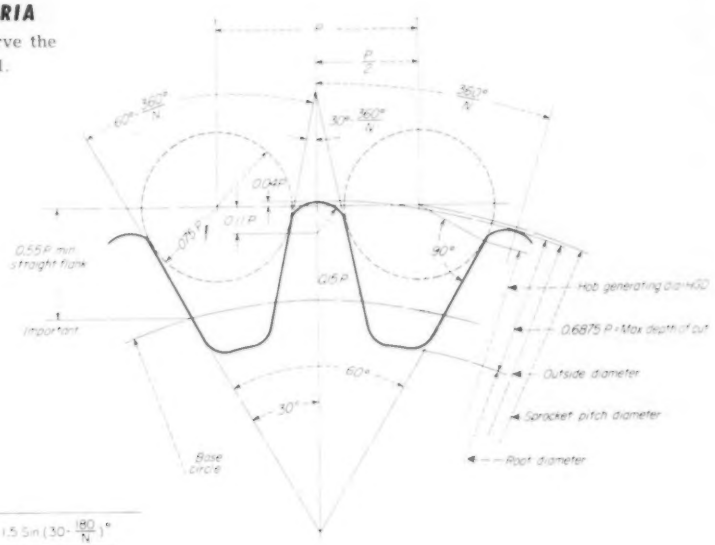
Sprockets for Silent Chains..III

HOB GENERATING CRITERIA

When sprockets are cut, observe the over-pin diameters on page 181.



$$HGD = P\sqrt{\frac{1}{\sin^2\frac{180°}{N}} + .5625 - \frac{1.5\sin\left(30-\frac{180}{N}\right)°}{\sin\frac{180°}{N}}}$$

GENERATING DATA

Chain Pitch	Hob Number	Basic Number of Teeth	Tooth Range of Hob	Generating Diameter
SC3 = .375	1	20	17 - 23	2.311
	2	28	24 - 32	3.247
	3	38	33 - 43	4.428
	4	51	44 - 58	5.971
	5	69	59 - 79	8.114
	6	95	80 - 110	11.212
	7	130	111 - 150	15.385
SC4 = .500	1	20	17 - 23	3.082
	2	28	24 - 32	4.329
	3	38	33 - 43	5.904
	4	51	44 - 58	7.962
	5	69	59 - 79	10.818
	6	95	80 - 110	14.950
	7	130	111 - 150	20.513
SC5= .625	1	20	17 - 23	3.852
	2	28	24 - 32	5.412
	3	38	33 - 43	7.381
	4	51	44 - 58	9.952
	5	69	59 - 79	13.522
	6	95	80 - 110	18.687
	7	130	111 - 150	25.641
SC6 = .750	1	20	17 - 23	4.623
	2	28	24 - 32	6.494
	3	38	33 - 43	8.857
	4	51	44 - 58	11.943
	5	69	59 - 79	16.227
	6	95	80 - 110	22.424
	7	130	111 - 150	30.770

Chain Pitch	Hob Number	Basic Number of Teeth	Tooth Range of Hob	Generating Diameter
SC8 = 1.000	1	20	17 - 23	6.163
	2	28	24 - 32	8.659
	3	38	33 - 43	11.809
	4	51	44 - 58	15.924
	5	69	59 - 79	21.636
	6	95	80 - 110	29.899
	7	130	111 - 150	41.026
SC10 = 1.250	1	20	17 - 23	7.704
	2	28	24 - 32	10.823
	3	38	33 - 43	14.761
	4	51	44 - 58	19.905
	5	69	59 - 79	27.045
	6	95	80 - 110	37.374
	7	130	111 - 150	51.283
SC12 = 1.500	1	20	17 - 23	9.245
	2	28	24 - 32	12.988
	3	38	33 - 43	17.713
	4	51	44 - 58	23.886
	5	69	59 - 79	32.454
	6	95	80 - 110	44.849
	7	130	111 - 150	61.539
SC16 = 2.000	1	20	17 - 23	12.327
	2	28	24 - 32	17.317
	3	38	33 - 43	23.618
	4	51	44 - 58	31.848
	5	69	59 - 79	43.272
	6	95	80 - 110	59.798
	7	130	111 - 150	82.052

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TALKING SHOP

Canned Bearings

Small precision bearings have for some time been delivered by Barden in wide-neck bottles to bar corrosion and dust. Other makers have used various devices, from grease and waxed paper on up. Timken has just installed a canning line to test various ways of tin-canning bearings for the armed services to give protection from Arctic cold, equatorial heat, salt water, dust—and our old enemy, rough handling. The cans are expected to preserve the bearings for years.

No Gall

WE TRIED RECENTLY, at the behest of Hans Ernst, research director at Cincinnati Milling, some test surfaces guaranteed not to gall. They're cut up in various patterns—by milling-cutter edge lines, crossing straight grooves, etc. But they ride on one another as smoothly as the most highly polished surfaces. Says Mr. Ernst: "Galling is caused *in the presence of vibration* by two surfaces rubbing together until both are chemically and physically clean. Then they weld—without heat or even much pressure—at the clean spot. That weld starts the galling. A little roughness—of the right kind—prevents it."

Sweet Coolant

ONE OF ALEMITE'S engineers confides that a West Coast company is using the Oil Mist system for supplying coolant in high-speed machining of aluminum and steel. The coolant: oil of wintergreen. A number of others have found the mist of coolant an answer on brass, particularly in tapping.

Hot and Cold to Order

FOR SOME YEARS, precision machine tools have been equipped with refrigerated coolant and lubricant systems, "warmed up" just before production starts, installed in controlled-atmosphere rooms. In some cases, such elaborate precautions have been abandoned after they were found more costly then helpful—or because products made under controlled conditions might not work outside them. Most recent report is application of radiant heat to bring spindles on a precision boring machine to temperature before starting time in the morning. Result is claimed to be more precisely bored cylinders.

Daffynitions

REPUBLICANS: Anti-HST-men . . . ARGUMENT: two people trying to get in the last word first . . . STRIPTEASER: girl unsuited for her work . . . U. S. MINT: most popular flavor . . . BATHING SUIT: two bandannas and a prayer . . . SUNBATHING WASHINGTONIAN: nude eel . . . AIR-FORCE HAIRCUT: hair raid . . . CHILDREN: "why?"s guys . . . SMILE: addition to face value . . . DOUBLE CHIN: flesh in the pan . . . SMALL FIB: facsimile . . . ZIG-ZAG LINE: distance between two joints . . . CHIROPRACTOR'S LICENSE: freedom of the press . . . SHIRT: man's bosom friend . . . LOVESICK DRUNKS: alcoholics enamorous.

Nine in One

SOMETIMES, having the exact equipment for a job is *not* essential—if you have men with know-how. We well remember one company that formed gun shields for destroyer escorts during World War II. The contractor had failed to make them in a 2000-ton hydraulic press—not enough "oomph" for the short-radius compound curve in heavy plate. But the sub-contractor made them in a 150-ton press with simple fullering dies—by taking many strokes, each in its proper place. And he did them so well, and so fast, that he beat delivery dates by half.

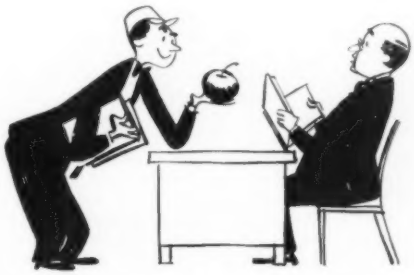
Another company, just after the war, had the chance to make some cores for hot-air furnaces, but all its presses were big. So all nine diesets for the job were set up on one press bed, and nine operators seated each at a dieset. They passed the parts from hand to hand around three sides of the press—making a production line out of one machine and a very different kind of "transfer press".

Methods to Shop

THE G. A. GRAY COMPANY, Cincinnati, has moved its methods department from the engineering section in the "front office" to a new mezzanine room out in the shop. The object: to bring methods men and shop men into closer cooperation. Results thus far are reported excellent.

School Incentive

AMERICAN LAUNDRY MACHINERY COMPANY, Cincinnati, has introduced a new policy for aiding white-collar workers to get advanced education. On appropriate courses at the University of Cincinnati, the company will pay the entire tuition cost if the student earns an "A", half if the student gets a "B", a quarter if the student makes a "C".



News of Metalworking

PLANT EXPANSIONS

• **Douglas Aircraft Co.** will produce aircraft sub-assemblies and honeycomb airplane panels in a 140x340-ft building purchased for $250,000 from Southern California Homes, Inc., Bell, Calif.

• **Lockheed Aircraft Corp.**, Burbank, Calif., is equipping a feeder plant in Beverly Hills to start production late in September on wing and tail sections of Super Constellation transports. A 69,000 sq ft building now used by Lockheed as a warehouse is being converted for aircraft manufacturing.

• **Seidelhuber Steel Rolling Mill Corp.**, Seattle, has started construction on the first unit of a $1-million steel rolling mill, first in the area. The initial installation will be a melt plant with 25-ton electric furnace.

• **SKF Industries, Inc.**, Philadelphia, has started construction in a $10-million plant expansion, equipment and machinery replacement program. Additions are being made to Philadelphia plants No. 1 and 2, and to the Shippensburg, Pa. plant.

New Drive to Break Bottlenecks, Push Defense Production

WASHINGTON—Last week, it began to look like Mobilizer Wilson was in the home stretch in his reform of DPA. He appointed Clay Bedford, formerly executive vice president of Kaiser-Frazer, as deputy administrator (DPA) for procurement and production.

Mr. Bedford is no novice to Washington. He's been one of Charles Wilson's assistants at ODM and was a guiding light in straightening out the machine tool bottleneck (see Machine Tools, page 119).

At the same time, Mr. Wilson and Manly Fleischmann agreed that the highpowered Production Executive Committee needed either a shot in the arm or abolishment. They decided to save it by giving it more and stronger powers. They also named Clay Bedford as chairman of the Production Executive Committee.

Under the reorganized agency setup, the PEC will be the heart and soul of DPA. It's represented by members from the Army, Navy, AF, Munitions Board, GSA (Stockpiling), DPA, and NPA. As such, it is a virtual board of directors for defense production and procurement.

• **First job of PEC** is to review the entire scheduling of some 650 defense items. Idea is to find out where the original scheduling was unrealistic. (Only about 100 items are delinquent—over 70 in electronics alone.) Out of this will come their recommendations as to whether an industry should be allowed to expand its facilities. This job indicates that Mr. Bedford and the PEC will probably get the responsibility of cleaning out the Certificate of Necessity muddle plus passing on future applications. Right now applicants may find that Mr. Bedford isn't too much in favor of immediate expansion. He'd like to see first a fuller and more efficient use made of existing plants.

But the most immediate job that the Production Executive Committee will have to do is straightening out the bottlenecks. PEC is only one of a number of Washington agencies that's been handed that order. But most of the agencies, like the Munitions Board, have lacked either power or desire to do the job.

• **Top bottlenecks** now are electronics and jet engine production. Mr. Bedford feels that the jet engine problem will largely straighten itself out with the easing of the machine tool scarcity.

DPA, incidentally, is taking its kudos this week for straightening out the machine tool problem. The pricing order is figured to be the answer.

But Mr. Bedford is figuring that it will be some time before the tools start running out in volume. Hence, he's going to have the Production Executive Committee "ration" tool distribution. They will do this by adjusting schedules so that a builder doesn't ship a tool to a plant where the roof isn't yet nailed down, especially when there's an immediate need for it elsewhere.

Mr. Bedford is advocating a steady increase in production. He's made that one of the basic goals of the Production Executive Committee. But, he wants the increase to come by getting maximum utility out of plants.

Canada Steps Up Buying Here

WASHINGTON—By April of 1952 Canadian arms purchases in the U. S. should be hitting more than a half-billion dollars, more than $100 million ahead of American purchases in Canada. Reason for the extended buying in the U. S. is a change in Canadian military planning.

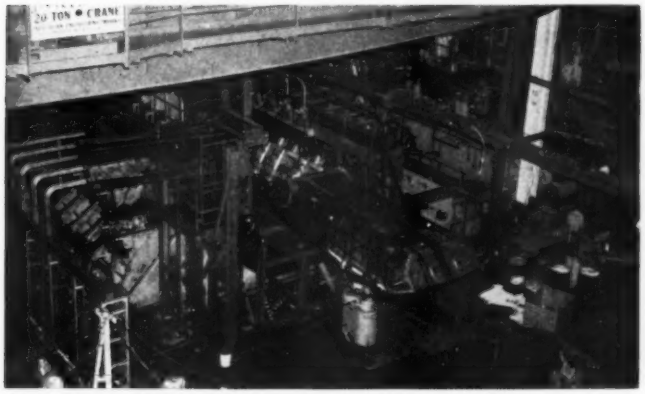
These expenditure figures point up a little publicized agreement between the U. S. and Canada which is turning into big business for arms manufacturers of the two countries. Last fall Canada and U. S. revived principles of the Hyde Park agreement of 1941 whereby U. S. would buy in Canada an equivalent dollar value of Canadian arms purchased in the U. S.

• **Canada had purchased** about $160 million in arms and equipment in the U. S. by the end of Canada's last fiscal year (March of this year). American procurement in Canada got off to a slow start—we were about 60% behind the Canadians.

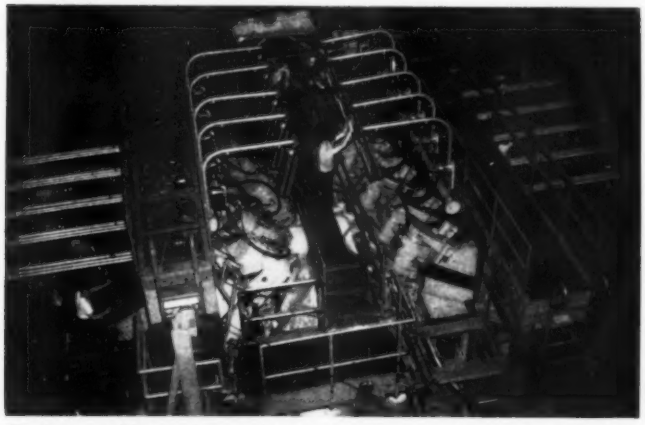
But this year the program steps into higher gear, and U. S. brass plans to spend about $700 million in Canada by 1953.

Right now the Canadians are buying tanks, rifles, planes and aircraft spare parts in the U. S. And, it's interesting to note that Canadian procurement in the U. S. alone accounted for more than 75% of all the cash purchases under MDAP during the last fiscal year.

• **U. S. military authorities** are stepping up buying in Canada, particularly in aircraft. Currently, the Canadian Corp. has contracts calling for $50 million in training planes for the USAF. These are the T-36A, Beech twin-engine planes for which Canadair has a licensing agreement with Beech Aircraft Corp. This order will soon be stepped up substantially. The Navy is also buying about $80 million in AA guns from Canada.



T-41E1 Walker Bulldog tank hull moves into position for a grinding operation on the Wean grinding machine, at Cadillac Cleveland Tank Plant



The huge machine is shown grinding suspension mounting pads on the tank hull, which is positioned beneath center catwalk

INDUSTRIAL BRIEFS

• **Detecto Scales, Inc.,** Brooklyn, has purchased the Yale scale business of Philadelphia division of Yale & Towne Mfg. Co.

• **A. Harold Frauenthal, Inc.,** Muskegon, Mich., has under construction a new 10,000-sq ft plant on an 18½-acre tract.

• **General Electric Company's** six manufacturing affiliates have become departments of the parent company. The six are Carboloy Co., Inc., Detroit; General Electric X-Ray Corp., Milwaukee; Locke Inc., Baltimore; Telechron Inc., Ashland, Mass.; Monowatt Inc., Providence, R. I.; and Trumbull Electric Mfg. Co., Plainville, Conn.

• **Georator Corp.,** Arlington, Va., has formed an electric products division, specializing in manufacture of permanent magnet generators. The Geophysical Instrument Co. division of Georator has acquired the facilities and business of the company formerly operating under that name.

• **Monsanto Chemical Co.,** St. Louis, and National Research Corp., Cambridge, Mass., have announced a joint research venture directed toward development of improved processes for production of titanium metal. Work initiated by National will be greatly expanded, and additional work will be carried on at Monsanto's Central research dept., Dayton.

• **Niagara Machine & Tool Works,** Buffalo, has moved its Detroit office to new and larger quarters at 15484 James Couzens Highway.

Huge Grinding Machine Helps Turn Out Tanks in Record Time

CLEVELAND—The Wean grinding machine shown here is one reason why the Cadillac Cleveland Tank Plant was able to get Walker Bulldog tank production lines moving in record time. It's the plant's largest manufacturing unit, weighing 350 tons complete with banks of hydraulic and electrical controls.

Built by Wean Equipment Corp., Euclid, Ohio, it took ten months to manufacture.

The multiple-head machine, first completely automatic adaptation of a bank of grinding heads to work on an angular surface, grinds at one time all ten mounting surfaces for suspension assemblies on the underside of the tank hull, and does the job in just 5% of the time formerly required when ground one at a time on a horizontal boring mill.

Operators control the big machine from catwalks built over the unit. To load the machine, these catwalks are hydraulically lifted up and swung away from the grinding heads. A tank hull is then lowered onto four mounting brackets, positioned and locked in place. Catwalks again swing into position and the automatic grinding cycle begins.

Each grinding head is independently controlled. While the head moves across the surface of the mounting pad, the depth of grind automatically increases with each pass. When the required depth is reached, the circular motion of the abrasive wheel stops and the grinding head withdraws.

HEALD CELEBRATES 125 YEARS OF METALWORKING

Herald Shop in Barre, Mass. about 1900

Stephen Heald

Leander Heald

WORCESTER, Mass.—This week a company which has been managed and owned by the same family through four generations, with the fifth coming on, will celebrate its 125th anniversary.

The Heald Machine Co. will have an Open House for the families of its employees and for the professional, business and civic leaders of the city of Worcester. It thus will modestly observe an anniversary which relatively few industrial firms in America have attained.

Stephen Heald, native of Concord, Mass., set himself up in business in a woodworking shop in Barre, Mass., in January, 1826. The shop was alongside a brook, which provided water power. He made and sold ox yokes, plow beams and farming tools to farmers for miles around, and did a variety of other jobs for them. Much of the trade was done under the barter system.

• **Later on the shop grew,** a blacksmith shop being added and, about 1840, an iron foundry. Cheese presses and corn cob crackers were new products of the shop. In 1846 Stephen Heald began to build steam engines.

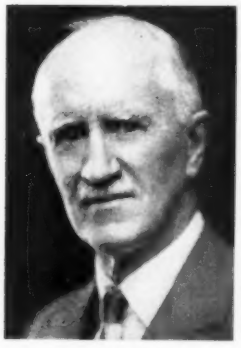
Eighteen years later Stephen Heald took his son Leander into partnership and the firm's name was changed to S. Heald and Son. The business swung over to agricultural implements, such as hay tedders and hay rakes. Iron stoves and sash trimmers also were among the firm's products. The stoves heated parlors in homes and schoolhouses. The sash trimmers were used by carpenters to cut angles in small and fancy windowpanes, which were one of the fads of that day.

Stephen Heald died in 1887. Leander thereupon offered a partnership to his son James, who had graduated from Worcester Polytechnic Institute only three years earlier. The name of the company became L. S. Heald and Son. Additional foundry and machinery items were made for wire-drawing equipment and for leather crimping presses.

• **Young James N. Heald** was impressed with the new metal-cutting process of grinding. He developed an attachment for lathes, which could do internal or external grinding and could refinish lathe centers. He also invented the American twist drill grinder for sharpening points of drills.

In 1903 he wanted to move the business to Worcester, where labor and materials were adequate, transportation was better, and more capital would be at hand. He obtained an option to buy his father's share in the business, as his father did not wish to leave Barre. He proceeded to sell stock to Worcester business men.

The first Heald Shop in Worcester, Mass., in 1903



James N. Heald

Roger N. Heald

Richard A. Heald

Robert S. Heald

On the last day of the option, James Heald and Ralph Morgan (who with his father and brother had subscribed to stock) drove by horse and buggy to Barre with the cash in a bag under the seat to close the deal with Leander Heald just before the option was to expire.

The Heald Machine Co. was incorporated on August 23, 1903, with James N. Heald as treasurer and general manager. Initial operation was in a building 90x100 ft., with 17 employees, the products being the same as at Barre. But soon J. N. as Mr. Heald was known, designed a 6-in. rotary surface grinder for the rapidly growing automobile industry, and later developed a cylinder grinder for that industry. In 1908 an internal grinder was introduced. These three types of grinding machines—rotary surface, cylinder and internal—have been the basis of Heald's growth through the years.

• **Many notable developments** have come out of Heald—hydraulic table feed, automatic sizing of work, internal centerless grinding, the precision finishing machine (known as the Bore-Matic). The company has grown steadily over the years and today has almost 2000 employees, nearly half of whom have been with the company at least five years. Its office and factory occupy 350,000 sq. ft. of floor space.

James Heald died in 1931. His two elder sons became regular employees of the company in 1919, and have managed the company ever since his death, Roger N. Heald as chairman of the board and Richard A. Heald as president. A third son, Robert S. Heald, is vice president.

Cost of Living . . . 125 Years Ago

Stephen Heald kept a ledger in his own handwriting during the first 15 years' business. In these days of inflation, it makes interesting reading, recording as it did the economics of 125 years ago. Here are some of the entries:

A Day's Pay	50¢ to $1
Rent of lathe for 1 day	.25
Filing and setting saws	.20
1 pair of shoes	1.25
5 hens	1.00
1 bushel of corn on cob	.50
Sawing 5000 shingles	5.00
4 gallons of rum	1.60
5 bushels of apples	1.00

Norman W. Rowand

John M. Demarest

William Avila

William H. Harris, Jr.

Names in the News

Norman W. Rowand has been appointed general manager, meter and valve division, Rockwell Mfg. Co., Pittsburgh. He was previously plant manager of the regulator division, Norwalk, Ohio.

J. W. McNairy has been appointed manager of General Electric Company's Appliance Park project at Louisville, Ky. Mr. McNairy was formerly manager of engineering and manufacturing of GE's Major Appliance department. He has been with the firm since 1917. **George J. Kane** has been named manager of manufacturing, jet engine parts division at GE's Bridgeport, Conn. plant. **Arthur R. Hines** has been appointed assistant manager of marketing, General Electric Co., New York. Mr. Hines has been associated with GE since 1921, and was previously manager of the Michigan sales district of the company's apparatus line. **Edmund C. Schorr** has been appointed manager of sales of GE's specialty transformer and ballast department at Fort Wayne, Ind.

Linwood L. Adams has been appointed manager, transportation planning, and **T. Lester Fossick, Jr.**, manager, traffic planning, United States Steel Co., Pittsburgh. Both Mr. Adams and Mr. Fossick have been assistants to the vice-president-traffic. **John H. Gorsuch** has been appointed manager of the company's personnel development, commercial department.

Howard E. Hornickel has been named works superintendent, Donora Zinc Works, American Steel & Wire Co., Donora, Pa. He succeeds **M. M. Neale,** retired.

John M. Demarest has been appointed assistant to the president, Utica Drop Forge & Tool Co., Utica, N. Y. He was formerly vice president and works manager, Marion Power Shovel Co.

Galen B. Price has been named manager of the purchasing research department, Ford Motor Co., Detroit. He has been with Ford since 1947.

Burton Field has been appointed plant manager, Dynakon Corp., Cleveland. **William Schwartz** was named chief chemist of the company.

George E. Hopf has been appointed manager, marketing division, Henry Disston & Sons, Inc., Philadelphia. Mr. Hopf has been associated with the company for 27 years and prior to his present appointment was hardware sales manager.

Edward M. Epstein has been appointed manager, quality control section, Nylon division, E. I. du Pont de Nemours & Co., Wilmington, Del. He has been with du Pont since 1922.

C. Fred Watkins has been appointed sales manager, Heller Bros. Co., Newark, N. J. He was previously general sales manager, American Swiss File & Tool Co.

W. E. Hawkinson, secretary and treasurer, Allis-Chalmers Mfg. Co., Milwaukee, has been elected a vice president of the company. **J. L. Singleton,** vice president-general machinery division, and **R. S. Stevenson,** vice president-tractor division, have been elected to Allis-Chalmer's board of directors.

William Avila has been elected vice president and plant manager, Bardwell & McAllister, Inc., Burbank, Calif. He was formerly production superintendent of the firm.

William H. Harris has been elected vice president in charge of engineering, Micromatic Hone Corp., Detroit. He was previously chief engineer of the company.

Robert N. Merk has been appointed chief engineer, Sharon Steel Corp., Sharon, Pa. He has been superintendent of the galvanizing and panel dept., H. H. Robertson Co., Ambridge, Pa. for the past four years.

Clyde W. Hull has been named assistant manager of manufacturing, Solar Aircraft Co's., San Diego plant. He was formerly manager of Solar's New York office. **Raymond W. Brick** has been appointed purchasing agent for the company.

Bradley Bartlett has been appointed chief engineer, Kling Bros. Engineering Works, Chicago.

V. de P. Gerbereux has been appointed manager of the centrifugal pump sales division of Worthington Pump & Machinery Corp., Harrison, N. J. He has been associated with the firm since 1924.

A. William Tilder has been appointed vice president and general manager, Acromatic Tool Co., Oak Park, Mich. He was formerly manager of carbide-tipped tools, Whitman & Barnes Div., United Drill & Tool Co.

John C. Buckwalter has been named chief engineer, Long Beach, Calif. plant, Douglas Aircraft Co. He succeeds **Fred J. Stineman,** deceased.

Brooks McCormick has been appointed joint managing director, International Harvester Co. of Great Britain, Doncaster, England. He has been with the company for about 10 years and was previously district sales manager in Dallas, Texas.

E. J. Pavesic has been named director of research, Lindberg Steel Treating Co., Chicago. **N. O. Kates** and **F. J. Finch** were appointed works metallurgist and metallurgist, respectively. **A. E. Uitti,** works manager, and **K. U. Jenks,** controller and secretary, were elected members of Lindberg's board of directors.

Robert F. Hodgson has been appointed sales manager, Hydraulic Equipment Co., Cleveland. He has been with the company since 1945.

Harry A. Dennis has been appointed assistant sales manager, Graver Tank & Mfg Co., Chicago. He was previously manager of sales, alloy division of the company.

Edward J. Brichta has been appointed sales manager, industrial air-cooled engine division, Continental Motors Corp., Muskegon, Mich. He has been associated with the firm since 1936.

W. C. Spruce has been named sales manager, Southwest district, DeVilbiss Co., Toledo, Ohio. Mr. Spruce has been associated with the firm for more than 23 years.

Robert C. Evans has been appointed executive assistant to the general manager, Western division, Atlas Mineral Products Co., Houston, Texas. He was formerly with the Sheffield Steel Corp.

H. Stanley Bimpson has been appointed consulting engineer, general machinery division, Allis-Chalmers Co., Milwaukee. He has been with the firm since 1920.

Robert S. Bubb has joined American Brake Shoe Co., New York, as marketing engineer. He was previously a management engineer with Robert Heller & Associates.

Arthur E. Gogel has been appointed traffic manager, Firth Sterling Steel & Carbide Corp., McKeesport, Pa. He was formerly associated with the Reading Railroad. **E. William Kalb** has been named assistant manager of Firth's steel sales division.

F. C. Stouffer has been named assistant superintendent of overhaul production, Texas Engineering & Mfg. Co., Dallas, Texas. He was formerly associated with North American Aviation. **Boyd Draper** has been named superintendent in charge of production, Luscombe Airplane Corp., A TEMCO subsidiary at Dallas.

Harold G. Cheney has been appointed sales manager, electronic tube division, Westinghouse Electric Corp., Bloomfield, N. J. Mr. Cheney joined the company in 1920.

L. L. Garber, vice president, H. K. Porter Co., Inc., has been appointed general manager of the company's Hinderliter Tool Co. Division, Tulsa, Oklahoma. He was formerly general manager, American-Fort Pitt Spring Div. and in that position will be succeeded by **H. A. Harrington.**

David C. Hall has been elected president and general manager, Diamond Mfg. Co., Wyoming, Pa. Formerly vice president and purchasing agent, Mr. Hall succeeds the late **William M. Powell.**

Virgil F. Bargeron has been appointed plant superintendent, Vic Pastushin Industries, Inc., Los Angeles, Calif. He was formerly factory manager. **H. Russell Hiller** and **William B. Stevens,** both formerly associated with Douglas Aircraft, have joined the Patushin firms. Mr. Hiller was named personnel manager and Mr. Stevens, chief inspector.

John P. Wright has been appointed factory manager of the durable goods operation of Liquid Carbonic Corp., Chicago. He was formerly vice president and general manager, A. B. Dick Co.

OBITUARIES

Edward B. Harkness, 76, retired U. S. Steel subsidiaries executive, died July 25. Mr. Harkness joined the Illinois Steel Co. in 1897 as secretary to the first vice president, in 1931 he was named secretary and treasurer of the company. He retired in 1940.

Alfred C. York, 57, director and vice president, Watson-Stillman Co., Roselle, N. J., died July 22. He had been associated with the firm since 1918, and was elected vice president and general sales manager in 1941, and a director in 1945.

Henry Woodruff, president, Woodruff & Stokes Co., Quincy, Mass., died during July.

Fred J. Stineman, 41, chief engineer of the Long Beach, Calif. division of Douglas Aircraft Co., died July 6. Among his engineering credits was development of the C-124 transport plane.

Theodore L. Brantly, Jr., president, Cro-Plate Co., Hartford, Conn., died August 8.

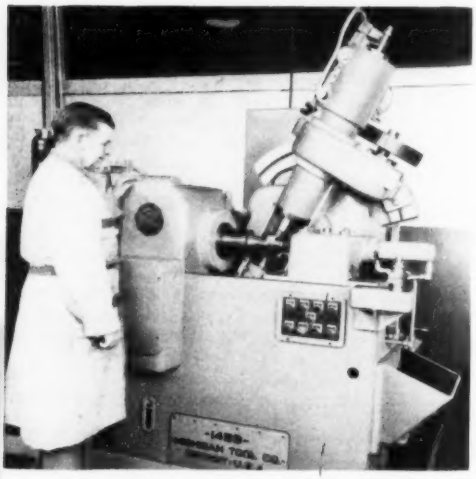
Harry E. Kohn, former president, Precision Grinding Wheel Co., Philadelphia, died August 8. Mr. Kohn became vice president of the company when it was founded in 1922, he became president in 1931 and resigned in 1945 because of ill health.

Léonard Michael, 68, retired assistant manager, equipment division, American Can Co., died August 7. He had been with the firm for 44 years.

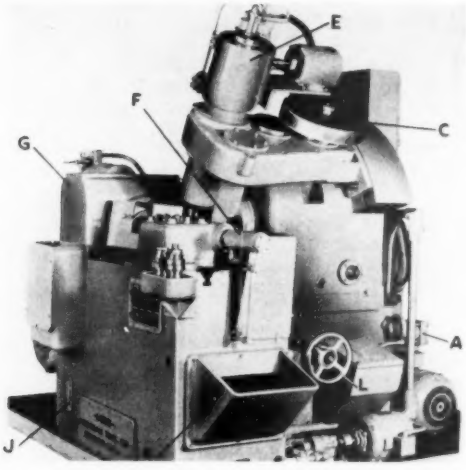
William H. Nichols

William H. Nichols, 78, president of W. H. Nichols Co., Waltham, Mass., died August 23. He served his apprenticeship as a tool maker at the Pratt & Whitney Co. and the Stanley works, and opened his own shop in 1902. The company which he later formed turned out precision aircraft parts. He was active in engineering societies and was noted for his inventions: the Zenith rayon pump, the Geroter pump, and the Nichols hand miller.

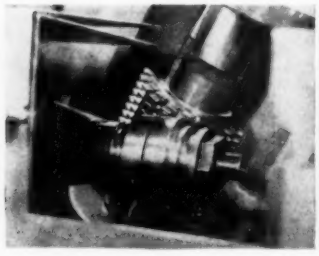
New Shop Equipment

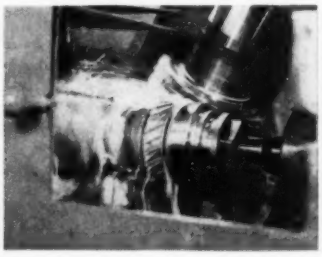


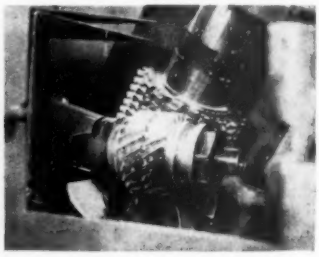
Automatic gear hobber operates at cutter-spindle speeds up to 100 rpm or more, and with greatly reduced travel of spindles. Result is short cycle time. In addition, it is able to cut gears at feeds above 1 4 in. per rev of work. Despite its high output rate, an operator can run two or more machines at one time



Side view shows (A) plunge-feed hydraulic cylinder; (C) flywheel to damp torsional vibration and take out chatter; (E) pushbutton-operated hob shifter; (F) cylinder for operating and applying pressure to tailstock; (J) coolant level gage; (K) chip-removal opening; (L) micrometer handwheel for adjusting depth of cut of plunge feed







Cycle on this typical run of two 3 1/8-in-OD, 9-DP 22-tooth, 31 2 3° helix gears of SAE 5130 (170-207 Bhn) is: operator places work on the spindle and presses cycle button. Tailstock center moves into place under hydraulic pressure (continuously maintained during cut). Then coolant pump starts, hob and work spindles start rotating and the hob-spindle column moves forward to correct depth with its center line 1/16 in. ahead of the work. The 5x5-in. hob plunge feeds in 0.29 in. At proper depth, feed stops and the work traverse-feeds (0.125 in. per work revolution) across the hob to a point 1/16 in. past center complete cut. Hob spindle then quickly retracts, work returns to loading position, spindles stop, and tailstock retracts. Total time—58 sec. 265 gears are produced per hob sharpening

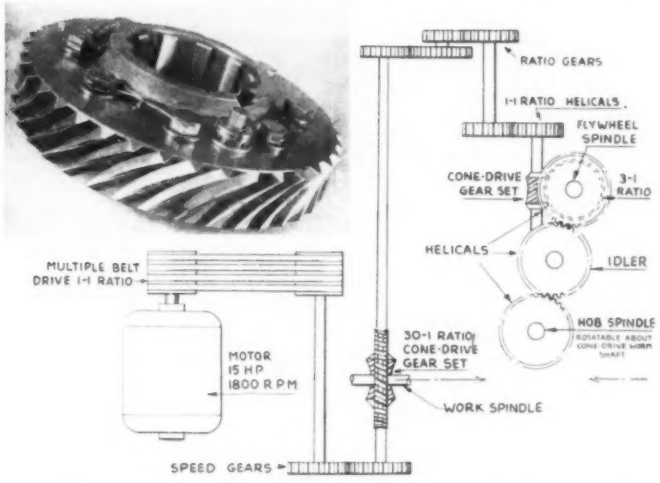
Automatic Hobber Plunge Cuts at 1000 rpm

Max. hob dia	7 in.
Max. hob length	7 in.
Min. hob dia recommended	2½ in.
Max. center distance between spindles	8 in.
Min. center distance	2½ in.
Max. swing of hob spindle	35 either side
Floor space	84x84 in.
Motor	15 hp @ 1800 rpm
Total weight	21,000 lb

Michigan Tool has entered the gear-hobbing field with a high-speed, high-production unit capable of cutting gears at a hob-spindle speed of 1000 rpm, or greater with simple gear changes. Minimum cycle time is attained by reducing motions and travel distances. Although the full utilization of these high speeds on steel will have to await the development of carbide hobs, HSS hobs are being used at 290 sfpm. Operating features are:

Reduced Travel—Total travel of hob or work during the cut has been reduced by eliminating all except 1 16-in. "approach feed" of the hob. This has been made possible by us-

Materials and Parts



Layout of gear system shows how most gears have been eliminated by dual hydraulic feeds. Smoothness was attained by eliminating bevel gears and using Cone-Drive double-enveloping gearing for index and main drive. Cone-drive gear in photo is of split construction to compensate for wear and resultant backlash. Cam is turned to produce a slight shift in position of the two halves

ing two separate feeds in sequence—a plunge feed to correct depth by the hob and a traverse feed of the work across the hob.

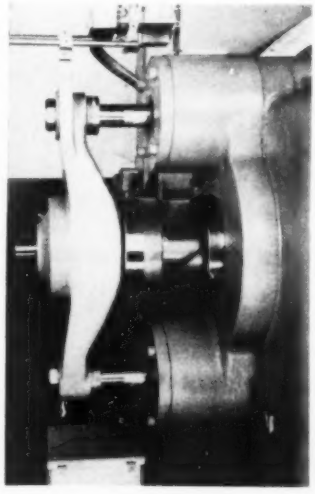
Rigidity and Smoothness — The machine is smooth and low in vibration at all speeds. Reasons are: Cone-Drive double-enveloping gearing, supplemented by close-fitting precision-shaved helical gears; dual hydraulic feeds eliminating 2/3 of the gears otherwise required; use of a flywheel to damp out torsional vibration; close-fitting and shaved involute and straight splines fitting in broached bores in place of keyways; large-dia heat-treated tubular instead of solid shafting and oversize gears for torsional rigidity.

Backlash — Avoided by precision fitting throughout. Hardened hob and work-spindle bushings replace the usual ways. Critical gears are internally adjustable for wear.

Loading—Manual loading and unloading is easy and rapid. Semi-automatic or automatic handling devices can be easily applied. The work is horizontally mounted and there is no tool interference.

Setup — Rate of feed (infinitely variable) is made by setting the dials on two valves, one for the plunge-cut

(Continued next page)



Lead errors are avoided by mounting the lead cam guide directly on the work spindle. The outboard bearing support may be quickly retracted and swung down out of the way when the guide assembly is replaced for work of different helix. Exchange can be accomplished in 20 min.; only two bolts on the support, and eight screws on guide and cam elements are involved

...INCLUDING

Method X shapes hard, metallic parts in a dielectric fluid by a controlled spark discharge page 194

Overhead conveyor system, battery-powered, is independent of outside source of energy. No overhead wiring page 204

Industrial cleaning machine will clean and dry the smallest parts used in industry. Has reversing motor page 206

Double head for bench welding has operating speed up to 3600 welds per hr. Requires minimum space page 208

Low-pressure cylinders operating on air, oil, or water uses a cork-floater ring for cushion alignment with the head page 210

NEW BULLETINS for your shop library include: 120-page cloth-bound handbook of reference data on stainless steel. Includes analyses, fabrication, and heat treatment **pages 201 & 202**

...and in Sept. 17

Valve face-grinding machine from Landis has automatic loader synchronized in a timed cycle to grinding wheel base

Hydraulically operated rotary table is self-contained and push-button controlled

feed and one for traverse feed. Can be changed during cutting. Fine-pitch screw adjustments on large screws provide accurate and quick settings of hob-spindle angle and depth of cut. The latter adjustment is through a handwheel with a micrometer dial ($\frac{1}{2}$ in. on dial equals 0.0010-in. increment).

Maintenance — Mechanical, electrical, and hydraulic units conform to JIC standards. Lubrication and coolant flow are automatic. Oil-air-mist lubrication is used, controlled by solenoid to start and stop with each cycle. Oil consumption is only 2 oz in 8 hr.

Hob Shifter—A pushbutton-controlled hob shifter is supplied as optional equipment. It is adjustable as to amount of shift by setting a single counter dial in the electrical panel to the number of increments desired per shift. One increment equals 0.0029 in. When hob has been shifted—either up or down as desired and preselected—to end of useful width, a signal light on the panel warns the operator of the necessity for changing hobs and an interlock prevents cycle start until hob is changed. Total width of hob covered can be preset by dogs on shifter drawbar. Hand-lever control provides rapid return of shifter.

Capacity—The machine can handle any helical or spur gear or spline up from $2\frac{1}{2}$ to 8 in. dia and $4\frac{3}{4}$ in. face width. Coarsest pitch recommended is three. Either climb or conventional hobbing can be done. If it is desired to interrupt the machine cycle before completion, the operator pushes the return button. All units then retract and the machine stops. Independent switches are provided for starting hydraulic pumps, coolant pumps, and for automatic or setup operation.

Hob and hob arbor are placed on the machine as a unit, premitting the hob to be checked between centers for accuracy of mounting, sharpening, etc. before insertion.

Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.

Method X "Machines"

Method X (Revealed in *AM*—March 5 '51, pg. 172, 190-194) can be described as the shaping of metallic parts in a dielectric fluid by a spark discharge of controlled intensity and duration. The original work was done by E. E. Tuebner, a diemaker who noted the erosion of electric-switch contacts caused by spark discharge. Later development was done, with Firth Sterling, by Mr. Tuebner and Dr. E. M. Williams of the Carnegie Institute of Technology.

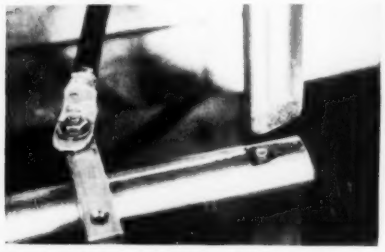
Ordinary ac is rectified to dc and applied to electrode (−) and work (+). The current builds up in the circuit to as high as 200,000 amps before discharge across the dielectric fluid. The high current density of the discharge ionizes the atoms surrounding the point where the arc strikes by knocking out valence electrons from their outer ring. The positively charged ions are then expelled by the surrounding positive body and simultaneously attracted by the negative electrode. The electrode is eroded too, at a rate that is as fast if not faster than the work. One reason advanced for this is a chipping action from the positive ions striking it. The particles of electrode and work are removed as a fine powder with their size a function of current density, cycle frequency, etc. The powder, with the aid of baffles, settles down through the fluid to a sump.

In theory, with a 50% duty cycle, as high as 50 lb per min of metal removal is possible.

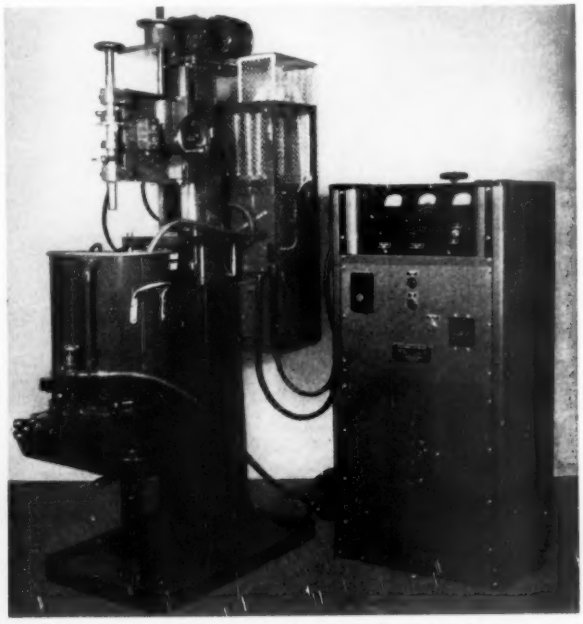
What It Can Do

Method X can be used to work such materials as sintered tungsten carbides, S-816, titanium, Vitalium, vanadium, hardened steels, and other such hard-to-machine materials. Practically any operation can be performed, such as boring, threading, tapping, turning, and drilling. For example, it is being used on an experimental basis to hollow out SH-16-titanium turbine-blade forgings for Allison.

One of its principal uses is in the machining of sintered carbides. Because carbides undergo a shrinkage of 15 to 20% in the sintering



Rough machining a hole in S-816 with a hollow electrode. Part will be used for sample holder in creep-rupture test



Method-X unit consists of the machine, left, and control cabinet, right. The electrode is carried on the column, work is clamped in the tank. The work table has longitudinal and lateral traverse and 360° rotation for work alignment. Driving motor for rotating the electrode when tapping is on the top of the column.

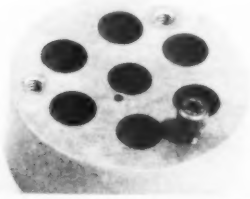
Carbides by Atom Expulsion

process, considerable stock had to be left on all surfaces to ensure adequate finishing. The result was much expensive grinding and lapping. With Method X, only a simple shape need be sintered, the work can then be machined to suit. Size tolerances can be held to 0.0005 in. and finish to 25 micro in. If a highly polished surface is desired, it is only necessary to leave 0.001 to 0.002 in. per surface for finish grinding or lapping. Minimum internal radii tolerance is limited to 0.002 in.

Operation

The brass electrodes used have a definite shape, depending upon the operation. When drilling and tapping through holes a hollow electrode is used. This leaves a slug of (say carbide) left, that can be salvaged and used as a die guide pin, thus saving expensive material. The electrode used for tapping is similar to a tap—that is, its whole length is threaded. This is necessary because a single-point chasing tool would soon erode and have to be changed. Also, the threads on the tap have to be more pointed than usual in order to produce the desired shape thread in the hole. A thin brass plate is used for cutoff, and shaped electrodes are used for complex holes.

The question has been raised as to why there isn't constant erosion of the upper portion of a drilled or tapped hole while the electrode is passing through the work. In other words, what prevents a hole from becoming tapered due to greater time for arcing at the beginning of a hole than at the bottom. The answer is that there is a certain maximum distance between electrode and work (depending upon the applied current and the discharge frequency) beyond which there can be no arcing. This distance for roughing cuts is usually 0.020 in. For finest finishing — 0.001. These distances are also, of course, how much undersized the electrode should be to produce a certain size hole. Spark discharge varies from 60 to 10,000 cycles per sec. depending upon finish desired.



The 1-in.-dia threaded holes in this blanking die were done by Method X using a hollow threaded electrode. Previous drilling (trepanning) is not necessary when tapping. The cores left by the tubular electrode can often be salvaged. Material is tungsten carbide

Dielectric Fluid

Cutting is done under a dielectric fluid which may be fuel oil, kerosene, or a special compound. Kerosene is being used now because its low specific gravity aids the process. A special fluid is being developed, however, which promises to double the cutting rate. The fluid is not contaminated in any way by the metal particles, and only need be replenished for the amount lost by evaporation and work carry-out.

Cutting Rates

Cutting rates seem to depend upon the density of the material. Although there are no tables yet, here are some examples for sintered tungsten carbide: to drill a ½-in.-dia hole 1-in. long—35 min. ± 10 min. To cutoff a 1x2 in. cross-section—45 ± 10 min. Rough machining tool steel is 60 to 70% faster than for tungsten carbide.

Setup on the machine is similar to that required for a jig borer. The work is clamped in the tank, and positioned with the aid of the graduated-scale rotary table.

A new model, the M4, is being developed which is reported to be at least four times as fast when finishing. This is due to improved condensers and other circuit refinements.

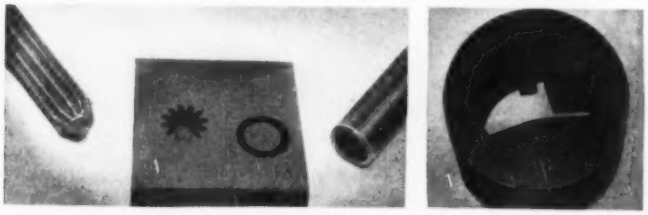
The Machine

Operation of the machine is almost completely automatic, requiring only that the work and electrode be inserted, the controls set and the starter switch thrown. The machine will then work without any further attention.

Electrode movement is automatically controlled by an Amplidyne and associated circuits. Power supply is from ordinary 220-v, 60-cycle single-phase lines. Peak demand under most severe cutting is 7 kw. Spark-discharge time is from 3 to 5 millionth of a second.

The Method X Co., an affiliate of Firth Sterling Steel and Carbide Corp., is currently doing some job-shop work and is also licensing the machine.

The Method X Co., 20 Lincoln Ave., Landsdale, Pa.



Female spline and trepanned hole in Firthite carbide block, left, with their respective brass electrodes. Complex hole put in carbide at right was done in three operations. (1) Three holes were drilled (accurately located) (2) A long electrode that started with three rods and ended with the right shape was put through (3) A finishing cut was made

Single Set of Lamps Provide Light for Photocopyer

Maximum ease and flexibility in photocopying engineering drawings and other large-sized originals is said to be assured with Remington Rand's Vacuum Seal Portagraph.

A contact printer, the Portagraph comes in two models, one with a copy surface area of 30 x 42-in. and the other with a 42 x 60-in. area.

A principal feature of the unit is a single set of white lamps which provide all the varying degrees of light intensity required in contact printing. The lamp layout, operating on a single circuit by means of a rheostat control furnishes the proper lighting for each individual type of reproduction.

Two sets of lights are used under subdued light or darkroom workroom conditions. One light illuminates the timer dial and the other is for inspecting the vacuum gauge reading.

Remington Rand Inc., New York 10, N. Y.

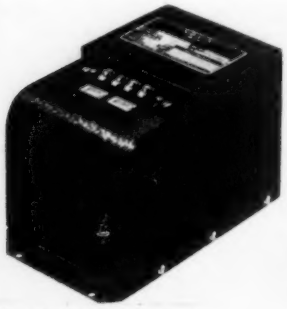
Diamond Turner for Landis, I. W., and Heald Grinders

The Citco hydraulic diamond turner, originally designed for Cincinnati Centerless Grinders, is now available for Landis Camamatic, I. W., and Heald Internal Grinders. On Heald grinders, the turner can be adjusted to 1/1600 of one turn per dress, or approximately $\frac{1}{4}$ degree, thereby eliminating loss of size on precision internal grinding.

Features of the diamond turner are its adjustability to three ranges of degrees, its automatic control which splits segments at the completion of each turning cycle, and its maintenance of a new and ever ready cutting edge throughout the life of the diamond.

It is said to be highly efficient in cutting grinding and diamond costs, stepping up production, and supplying micro finishes to parts.

Cleveland Industrial Tool Co., Inc., 1080 E. 222nd St., Cleveland 17, Ohio



Electrical Control Device Reacts To Small Voltage Changes

The basis of the Sola Sensivolt involves a resonant electrical circuit somewhat similar to the constant voltage transformer. One of the applications of this control is in combination with a power relay and a resistor as a switching device.

The electrical circuit consists of three windings, a primary winding, a secondary winding, and a relay coil winding in series with a capacitor which comprises the resonant circuit. The magnetic circuit consists of a closed core with a magnetic shunt.

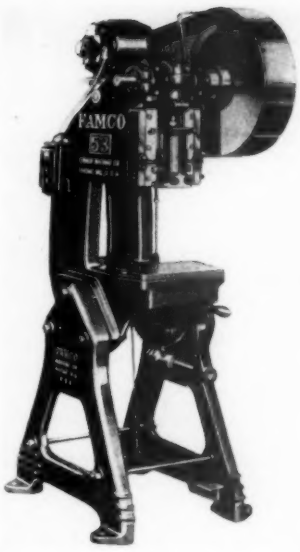
When low voltage a-c is applied to the primary winding of the transformer, very little of the flux generated cuts the secondary winding, due to the loose coupling. By controlling the reluctance of the magnetic circuit, the voltage of the secondary can be controlled.

Thus it is possible to have a static a-c voltage-sensitive control capable of differentiating changes as small as $\frac{1}{2}$ v in a-c voltage and handling larges amounts of power.

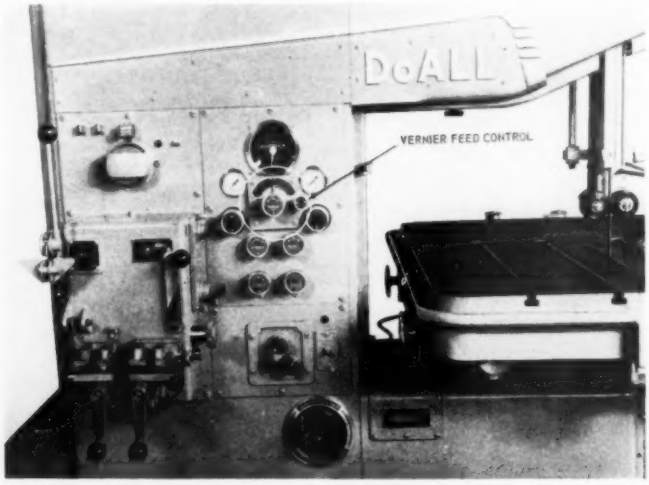
The Sensivolt can be employed to react automatically to whatever unpredictable fluctuations occur in line voltage; or it can be stimulated deliberately by modulating voltage at the power source.

Among initial uses for the device are remote operation of auxiliary power equipment at isolated stations; protection of motors and equipment against excessively high or low voltage; step by step voltage regulation; and control of several selective voltage circuits from a single source.

Sola Electric Co., Chicago, Ill.



DEEP-THROAT MODEL of open-back, inclinable power press; one of five added to Famco's line of small presses. Rated in 5 to 8 ton capacities, they will take work 20 and 24 in. dia, and offer four shut heights from 6 to 13 in. with up to 3 in strokes. Other units in the Famco power-press line include models of from 3- to $7\frac{1}{2}$-ton capacity-*Famco Machine Co., Racine, Wis.*



LABOR-SAVING IMPROVEMENT on the DoAll Contour-matic is this hydraulic-feed work table. Heavy work pieces are clamped to the table and the operator simply turns a valve to advance the work to the cutting tool. Delicate control is maintained by a vernier for sensitive adjustment of table travel. The control also prevents shock or damage to the tool or work by reducing the starting feed rate to compensate for the 200 lbs pressure moving the table. Hydraulic brakes on band wheels work automatically if band breaks— *DoAll Co., Des Plaines, Ill.*

World's finest and fastest hole producer

LELAND-GIFFORD
No. 2LMS
Motor Spindle Drilling Machine

In the range where both quantity and quality count — holes from 1/16″ to 3/4″ — the Leland-Gifford No. 2LMS has earned an unqualified reputation for fast, accurate, economical production. Available in any combination of spindles from one to six; swings of 14″, 20″ or 26″; and speeds up to 3600 RPM, it offers a basic machine which we can readily adapt to your specific needs.

Write for Complete Information

PRECISELY ADAPTED TO YOUR NEEDS

Production drilling **Reaming**	Sensitive hand lever feed with ratchet adjustment or semi-automatic power feed with three feed rates and positive, adjustable depth stop.
Facing **Deep hole drilling**	Plain or Step-by-Step hydraulic feed with infinitely adjustable feed rate and automatic overload release.
Tapping	Reversing motor or high speed, ball bearing friction attachments for tapping at drilling speeds.

PRODUCTION MEN

Get this Handy Slide Rule

A valuable aid in figuring costs and setting production schedules. Quickly gives time required to drill holes of any size and depth in any material. It's free. Write the nearest office

SAVE TIME — **CONTACT THE OFFICE NEAREST YOU**

LELAND-GIFFORD
Drilling Machines

WORCESTER 1, MASSACHUSETTS, U.S.A.

Carboloy Adds to Tipped Twist-Drill Line

Standardized carbide-tipped twist drills for cast-iron drilling have been added to the line of blanks carried in stock by the Carboloy Dept. of GE.

Standard tips, ranging in size from 1 4 to 1 in. (normal dia) in 1/16 in. steps are of grade 44A. Other sizes are available on special order.

Twist drills tipped with carbide can double the rate of drill penetration and still obtain a life of 3 or 4 times that of the un-tipped drill. When operated at the same speed as steel twist drills, tipped drills are said to give about 10 times the tool life.

Standard twist-drill tips of grade 883 carbide for drilling nonferrous materials are also carried in stock in 23 sizes, including the same sizes available in 44A.

Carboloy Dept., General Electric Co., Detroit 32, Mich.

Heli-Coil Makes Available Small Thread Inserts

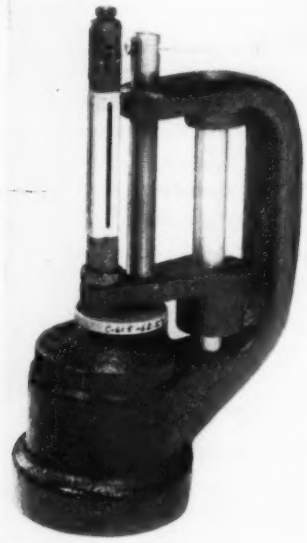
Four small-size stainless-steel helical-wire thread inserts, for strengthening tapped threads in aluminum, magnesium, plastic, iron, steel, brass, bronze, and wooden components, are available from the Heli-Coil Corp.

These sizes, extending the use of the company's thread series, in small holes, include 8-36 and 6-40 sizes in the fine-thread series, 5-40 and 4-40 sizes in the coarse-thread series and are available in 1, 1½, and 2-diameter lengths.

Installation of helical-wire thread inserts in either small components or heavy-industry castings accomplish the same result—stronger and more durable threads. Insert-lined holes withstand substantially higher loads and threads in these holes are more resistant to wear, corrosion, seizing, and galling.

Industrial applications include use as original manufacturing components, as repair parts in maintenance, and as repair parts for threads damaged in production.

Heli-Coil Corp., 17-23 Thirty-fifth St., Long Island City 1, N. Y.

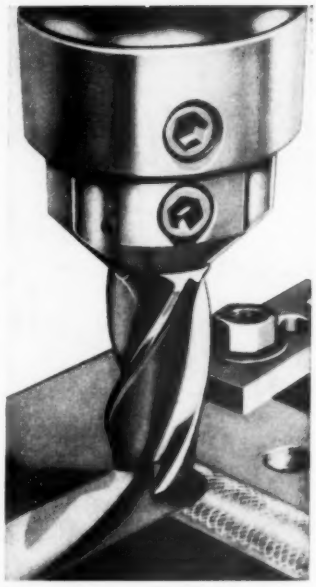


Metalometer Has Tungsten Point

A Metalometer with Peabody Anvil attachment features a tungsten point, micro interior finishes, and trigger release mechanism. It is said to broaden the application of testing the surface hardness of small parts.

Sheet steel, gears, castings, tool bits, drills, etc., can be accurately checked with the anvil attachment. The pocket size precision hardness testing instrument has been reported to have found a wide acceptance by the Armed Forces.

Peabody Industries, Inc., 12129 Hamilton Ave., Highland Park 3, Mich.



Heavy Duty End Mill and Holder Moves Metal Faster

Heavy duty end mills with 2-in.-dia shank are held by an end mill holder which bolts securely on the spindle nose of all milling machines using a No. 50 standard taper.

True running is assured by the use of a centering plug which fits into the spindle taper. The driving of the holder is accomplished by the drive keys on the spindle nose. The bolting of the holder on the spindle end makes it practically integral with the spindle.

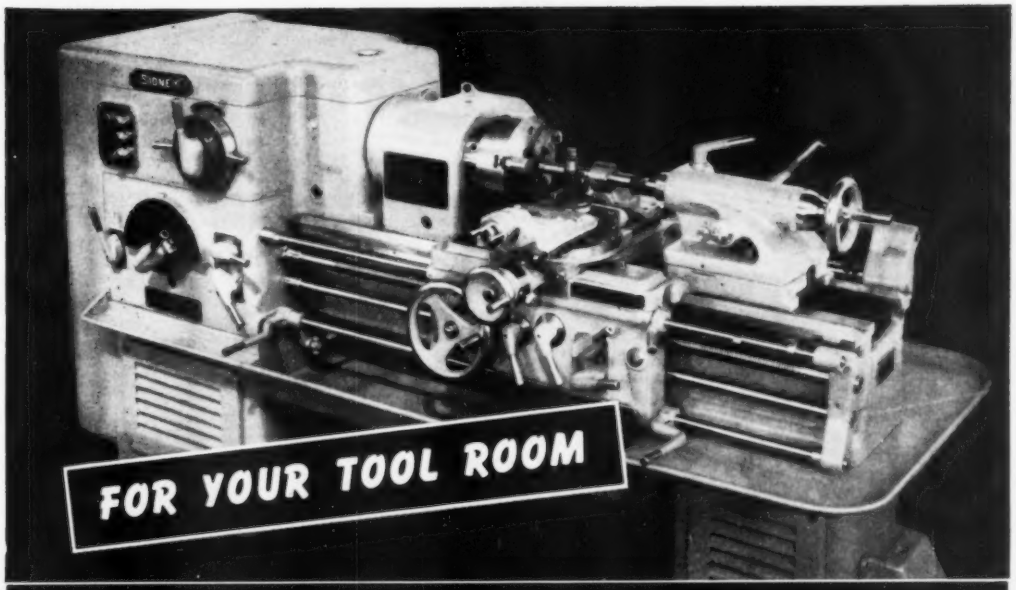
It is claimed that these larger end mills will take unusually heavy cuts and generally move metal faster.

Weldon Tool Co., 3010 Woodhill Rd., Cleveland, Ohio

A concrete hardener called Flintcrust Liquid transforms bare concrete into a case-hardened surface impervious to destructive chemicals, oil and grease. It counteracts and prevents "sanding" and eventual surface breakdown; and facilitates mobility of vehicles by reducing "drag."

Flintcrust is easily applied by flushing, without interrupting normal plant operation. It will harden any concrete or cement compound floor even while standing or working on it. Approximate coverage: ⅞ gal per 100 sq ft.

Flexrock Co., Filbert & Cuthbert, W. of 36th St., Philadelphia 4, Pa.



SIDNEY Universal Relieving Attachment

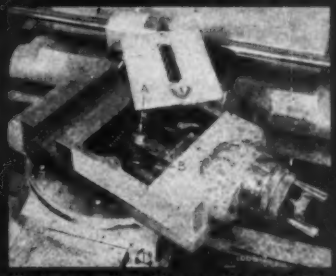
Here is an entirely new development which has many advantages over the conventional relieving attachment.

It is adaptable to Sidney Lathes already in the field as well as to new machines and incorporates a 4 to 1 spindle speed reducer integral with the change gear housing thus eliminating the need for 2-speed motors or other costly devices to reduce spindle speed. Universal joints have been eliminated entirely. A timer arrangement enables the operator to pick up any relief at any point with a minimum of effort. A clutch lever is provided to disengage relieving attachment for conventional turning.

This attachment will handle plain external relieving, spiral relieving, form relieving, end relieving and internal relieving.

For complete details write us or contact a Sidney representative.

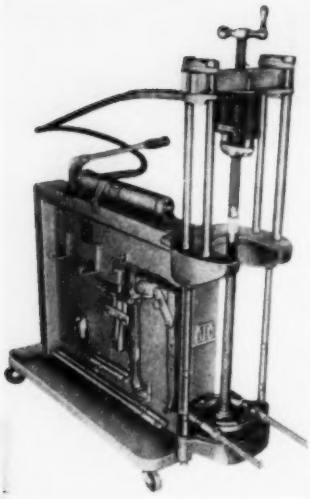
Rear view showing change gear housing with conveniently located index plate.



Illustrates adjustable cam throw. Additional cams are not required to obtain various throws.

SIDNEY MACHINE TOOL COMPANY • SIDNEY, OHIO

Builders of Precision Machinery Since 1904



Tool Carrier Has Built-in Hydraulic Press

The Portable Hydra-Tote is a carry-all designed to facilitate maintenance work by taking pulling tools to the work. It provides a place for a complete set of OTC puller tools; permanent steel hangers for basic items and a tray for extra parts. In addition, a 17½-ton hydraulic press is built into the unit.

It is of sturdy, welded-steel construction. There is 10 1/2 in. of clearance between the press uprights, 11 in. clearance from the ram to the top of the press plate, and 34 in. from press plate to floor. Almost unlimited vertical adjustments is possible with interchangeable legs in the upper press frame and three adjustments in the lower press frame. It is equipped with 3-in. rubber casters for easy mobility.

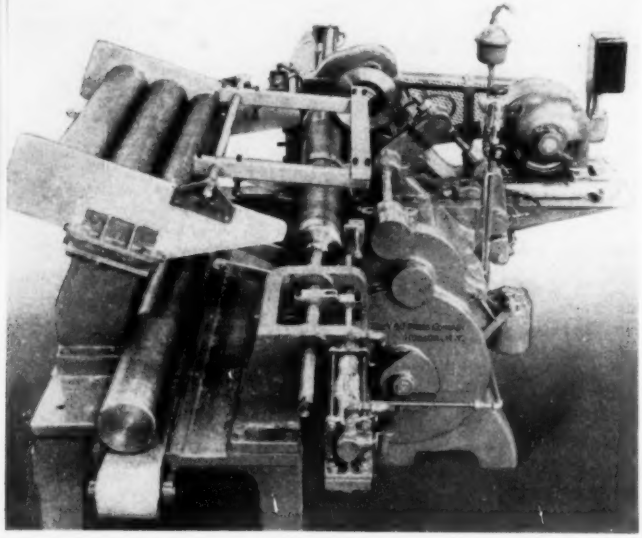
Owatonna Tool Co., 385 Cedar St., Owatonna, Minn.

A light-capacity, power-driven conveyor, Chain-Veyor is extremely flexible for short-radius curves. Track sections can be adapted to individual needs.

It will handle loads up to 30 lbs on each pendant spaced at 6-in. intervals or, 60-lb loads can be carried at 12-in. intervals when supported by cross-bar attachments.

The heavy duty drive uses a special sprocket drive to distribute chain stresses and affords a straight-line pull and permits operation in either direction. Mounting is made at any 90° corner of the conveyor line.

Southern Engineering Co., Inc., 249 N. First St., Burbank, Calif.



DESIGNATED THE NO. 986 SHELL TRIMMER, the machine handles 155-mm shells having a max length of 52 in., max dia of 8¼ in., and 0.150 in. thick. It is equipped with an automatic chute for feeding the shells, has an air-operated mechanism for positioning when trimming, and automatic ejection to deliver the shells to a conveyor—*V & O Press Co., Div. of Emhart Mfg. Co., Hudson N. Y.*

Polishing machine for light buffing or coloring work is driven by a 1/4-hp, ac or dc motor mounted on the stand.

The machine is equipped with two self-aligning ball-bearing pillow blocks and has a ¾-in.-dia spindle, 22 in. long. The spindle is tapped for taper points which are furnished with the machine.

The polisher is semi-portable, weighing about 100 lbs.

Lewis Roe Mfg. Co., 1050 DeKalb Ave., Brooklyn, N. Y.

Pneumatic Industrial Cleaner Uses Vibrating Compressed Air

This industrial cleaner creates, by the jet principle, an agitating suction, which forces dirt and metal particles into a container supported on the back of the operator.

By operating a second of two finger-tip control valves, a vibrating external air jet can be used. This jet is directed forward through an orifice in the cleaner head to dislodge dirt and metal particles from inaccessible places to spots where they can be picked up by changing to suction.

A vibrating valve action reduces air consumption by shutting off the air supply 2000 times per min. The cleaner head is polished aluminum and the wands are lightweight tubing. No oil is required as the metal parts are oil-impregnated. It operates from any 80 psi and up compressed-air source.

Standard nozzle widths are 5, 8, and 10 in. Wand lengths are from 14 in. to 6 ft depending on the application. Total weight of the unit is 7½ lbs. Several sizes of castered-tank models from 20 to 55 gallons can be had for wet or dry cleaning operations.

Vibro-Pneumatic Cleaner Div., Patterson Products., Detroit, Mich.

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FYI—these initials symbolize information that's important. And there is much of importance in the literature listed here. To get the ones you need, all you do is fill out one coupon for each booklet you wish to order. Indicate in the circle on the coupon the number of one catalog wanted. When you have filled out a card, detach, stamp, and mail. We'll do the rest.

MACHINES AND ATTACHMENTS

1 CHUCKING AUTOMATICS—*Cleveland Automatic Machine Co., Cincinnati, Ohio.* 8-page illustrated booklet of data, ranges, and capacities of model AB Pneumatic, a single-spindle bar machine.

2 PUNCH CAPACITIES—*Kling Bros. Engineering Works, Chicago, Ill.* Bulletin 711 contains complete punch and shear capacity charts, specifications, and details to meet specific punching requirements.

3 AUTOMATIC LATHES — *Federal Sales & Engineering, Ltd., Toronto, Canada.* 4-page illustrated pamphlet on the Swiss-made Mauruhin automatic screw machines. Contains capacities, data, construction, and operational description.

4 HEAVY-DUTY ROUTER — *Onsrud Machine Works, Chicago 17, Ill.*—12-page illustrated bulletin on routing, shaping, and milling work handled by Onsrud W-244 and W-304 Routers in aluminum and related metals.

5 AUTOMATIC POINTER — *Economy Engineering Co., Willoughby, Ohio.* 4-page illustrated bulletin describing Type 8800 Automatic Pointing Machine. Contains operations and specifications.

6 THREAD MACHINE—*Carl Hirschmann Co., Manhasset, N. Y.* 8-page illustrated booklet describing Swiss precision machine for cold rolling threads.

7 CHIP REDUCTION—*American Pulverizer Co., St. Louis, Mo.* 8-page illustrated bulletin of technical data, construction features, and case histories of metal turning crushers.

8 HOBBING MACHINES—*Lees-Bradner Co., Cleveland 11, Ohio.* 8-page illustrated catalog describing single and rotary gear-hobbing machines, parts and equipment.

9 SHELL TRIMMER—*Dayton Rogers Mfg. Co., Minneapolis 7, Minn.* 4-page bulletin of operational data on Dayton Shell Trimmer.

10 VERTICAL BORING MILL—*Baldwin-Lima-Hamilton Corp., Hamilton, Ohio.* 4-page illustrated bulletin describing modernized 42 in. vertical boring and turning mill. Includes specifications, capacities, and operating procedures.

TOOLS AND ACCESSORIES

11 CHEMICAL COOLANT—*F. E. Anderson Oil Co., Portland, Conn.* 20-page illustrated, thumb-indexed catalog of properties and applications of Lumol, an all chemical metalworking solution.

12 DIE MAKING — *Corro de Fusco Corp., New York 5, N. Y.* 20-page illustrated manual of practical information on the Corrosmatrix method of punch and die sizing.

13 CAST ALLOY CUTTERS—*Crobalt, Inc., Ann Arbor, Mich.* 4-page bulletin on the advantages, limitations, and applications of Crobalt cast alloy cutting tools.

14 POWER TOOLS—*Seico-Cranz Co., Toledo 1, Ohio.* 48-page illustrated catalog on power tools for cutting, shaping, drilling, and finishing metals, wood, fibre, and plastics.

15 TWIST DRILLS — *DoAll Co., Des Plaines, Ill.* 12-page illustrated catalog of stub drills, fluted drills, and drill sets. Includes charts and tips on drill pointing and web thinning.

16 GAGE BLOCKS—*Pratt & Whitney, Div. Niles-Bement-Pond Co., W. Hartford 1, Conn.* 8-page illustrated brochure on solid carbide precision gage blocks from 0.050 to 4 in.

17 BONDED TOOLS—*Triangle Equipment Co., Nutley, N. J.* 8-page booklet on metal-bonded diamond tools, including files, wheels, and special tools.

18 TOOL ACCESSORIES — *Precision Supply & Machine Co., Paterson, N. J.* 8-page catalog of rotary tool accessories including felts, brushes, abrasives, mounted wheels, points, etc.

19 OPTICAL STRAIGHTEDGE—*F. T. Griswold Mfg. Co., Wayne, Pa.* 4-page illustrated booklet shows how a beam of light is used as a straight-line reference in measuring variations in surface flatness. Accessories are also described.

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HEAT TREATING AND WELDING

21 STUD WELDING—*K S M Products, Inc., Merchantville, N. J.* 32-page illustrated manual on techniques of stud welding. Includes equipment, data, and photographic explanation of process.

22 INDUCTION HEATING—*Ajax Electrothermic Corp., Trenton 5, N. J.* 8-page selector chart for induction heating and melting. Includes applications and equipment, tables of speeds, and case histories of installations.

23 WELDING ACCESSORIES — *Cam-Lok Div., Empire Products, Inc., Cincinnati 26, Ohio.* 4-page bulletin of arc-welding accessories; cable connectors, electrode holders, and terminal connections.

24 SPOT WELDING — *Ampco Metal, Inc., Milwaukee 46, Wisc.* 4-page reference sheet giving the recommended schedules for spot welding low carbon steel.

25 BENCH HEADS—*Federal Tool Engineering Co., Newark 5, N. J.* 8-page bulletin describing single or double bench heads with Tweaver-Weld automatic action.

PLANT SERVICE EQUIPMENT

26 METAL CLEANING—*Oakite Products, Inc., New York 6, N. Y.* 44-page illustrated booklet describing specific materials, equipment, and procedures for the removal of soils in metal-fabricating processes.

27 CHAIN DRIVES—*Chain Belt Co., Milwaukee 1, Wisc.* 24-page illustrated booklet on the installation, operation, and maintenance of chain drives and conveyors.

28 BLAST CLEANER — *Vaco-Blast Cleaner Co., San Mateo, Calif.* 12-page illustrated catalog of a blast cleaner with a vacuum pick-up. Includes description and applications of Vaco-Blaster equipment.

29 STORAGE BATTERIES — *Gould-National Batteries, Inc., Trenton 7, N. J.* 56-page illustrated handbook of technical instructions and engineering data on the care of motive-power storage batteries. Includes section on battery charging. Revised edition.

30 INDUSTRIAL FLOORS — *Flash-Stone Co., Inc., Philadelphia 44, Pa.* 12-page illustrated catalog on specifically-engineered industrial floors for maximum life and service.

31 FLOOD LIGHTING — *Magnet-Lite, Inc., St. Albans 12, N. Y.* 16-page illustrated folder describing equipment for industrial flood lighting.

32 ROLLER CONVEYORS — *R. W. Buschman Co., Cincinnati 27, Ohio.* 8-page illustrated catalog of portable roller and wheel conveyors. Includes specifications, equipment, and applications.

33 FLOORING COMPOUND — *United Laboratories, Inc., Cleveland, Ohio.* 8-page illustrated brochure of technical data on Plastic Rock flooring.

PARTS AND MATERIALS

34 STAINLESS STEEL — *Allegheny Ludlum Steel Corp., Pittsburgh 22, Pa.* 128-page illustrated cloth-bound handbook of reference data on 40 Allegheny stainless steels. Includes analyses, fabrication, heat treatment, etc.

35 ROLLER CHAIN—*E. B. Sewall Mfg. Co., St. Paul 4, Minn.* 68-page illustrated catalog of complete line of sprockets and roller chain. Includes specifications, data sheets, and prices.

36 PANELBOARDS — *Westinghouse Electric Corp., Pittsburgh 30, Pa.* 24-page illustrated booklet describing circuit breaker panelboards for the control and protection of power applications.

37 CAST IRON—*International Nickel Co., New York 5, N. Y.* 16-page illustrated reference bulletin describing nickel cast iron: its properties, applications, and specifications.

38 LABROSCOPES—*Bausch & Lomb Optical Co., Rochester, N. Y.* 25-page illustrated catalog of new line of laboratory microscopes. Describes features, construction, and accessories.

39 SPEED REDUCERS — *Cleveland Worm & Gear Co., Cleveland 5, Ohio.* 8-page illustrated bulletin on application and construction of worm gear speed reducers.

40 STEEL LENGTHS—*United States Steel Co., Pittsburgh 30, Pa.* 72-page booklet of Tables of Multiple Lengths, designed to minimize waste in cutting steel.

41 MAGNETIC DRIVES—*Electric Machinery Mfg. Co., Minneapolis 13, Minn.* 12-page illustrated handbook of technical information on magnetic drives and the magnetic-amplifier regulator speed control.

42 HYDRAULIC DEVICES—*Logansport Machine Co., Logansport, Ind.* Pocket-size information manual on setting up and servicing air and hydraulic devices.

43 TUBING STEELS—*Babcock & Wilcox Tube Co., Beaver Falls, Pa.* 4-page bulletin of data on 14 alloy steels used in production of tubular parts. Solves problems of alternate grades.

44 ALTERNATE STEELS — *Republic Steel Corp., Cleveland 37, Ohio.* 12-page illustrated booklet describing Type 18S stainless steel (which contains no nickel). Data and properties are given.

MISCELLANEOUS

45 CORROSION—*Carpenter Steel Co., Alloy Tube Div., Union, N. J.* 16-page notebook contains data on the corrosion resistance of various types of stainless tubing and pipe. Also describes the various corrosions.

46 MIN. BENDING RADII — *Kaiser Aluminum & Chemical Sales, Inc., Oakland 12, Calif.* 11x17-in. chart gives the recommended minimum radii for the proper bending of aluminum sheet in various gages.

47 SHOCK RESISTANCE—*The Barry Corp., Watertown, Mass.* 16-page bulletin describes the basic principles and methods of designing for shock resistance.

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The amazing decrease in oil consumption of a well-known metalworking company*.

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Fully automatic, unbelievably simple . . . Alemite's revolutionary Oil-Mist Lubrication System *atomizes* oil into mist, distributes it through tubing to bearings. Bathes *all* bearing surfaces with fresh, clean, cool oil film. Uniformly maintains oil film on all sliding, rubbing, rolling parts regardless of variations in load, temperature or speed. No "peaks and valleys" of lubrication.

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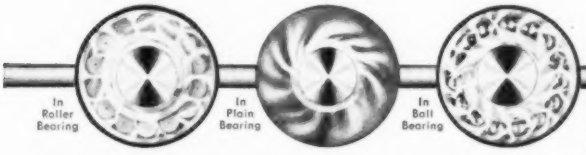

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- Continuous lubrication—to all bearings simultaneously.
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- Positive Seal against dirt and abrasives.
- Reduced Bearing Temperatures.
- Prolonged bearing life—as much as 17½ times.
- Prevention of product spoilage.
- Substantial reduction in the number of oils needed.

Alemite OIL-MIST Lubrication

Oil Mist DESK-TOP DEMONSTRATION. No Obligation—Mail this coupon now. A trained Alemite Lubrication Engineer will give a Desk-Top Demonstration at your office, no obligation.

Alemite, Division of Stewart-Warner, Dept. C-91
1850 Diversey Parkway, Chicago 14, Illinois

☐ Please have your Alemite Lubrication Representative arrange a desk-top demonstration of Oil-Mist. This entails no cost or obligation on my part.

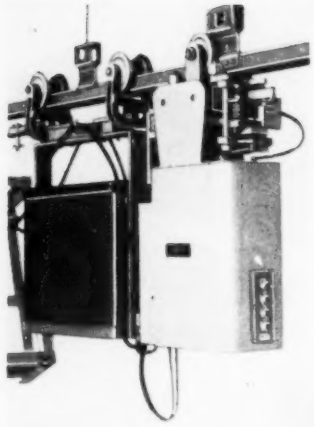
☐ Please send me information about Oil-Mist by mail.

My name _____

Position _____

Company (leave blank if letterhead attached) _____

_____



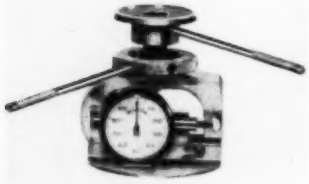
Self-Powered Conveyor Unit Eliminates Overhead Wiring

Called Mono-Dyne, the overhead conveyor system is battery powered, making it completely independent of any outside source of energy. The driving power is self-contained and travels along with the conveyor itself. Installation is cheaper due to the elimination of overhead wiring. It was designed for easy incorporation into present manually operated systems.

The unit is capable of multi-speeds, forward and reverse, and can be operated by either push-button or remote control. It can operate outdoors, from plant to plant, as well as inside, and can ascend grades.

Because no wiring of any kind is required, there is complete safety to personnel.

The Bloom System, Inc., 1941 W. Davidson Ave., Detroit 23, Mich.



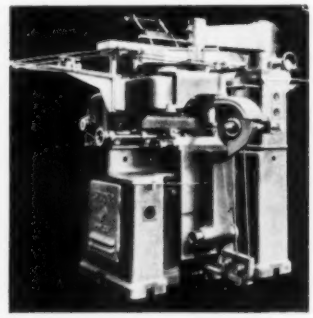
U-Bar Pressure Gage Measures by Deflection of Bar

The pressure gage is built around a special U-shaped tool-steel bar, heat-treated for long-lasting resiliency. A jeweled dial indicator is mounted at the null point of the bar. Load is applied by means of a hardened ball resting in an anvil on one side of the steel bar. Slightest inward pressure or deformation of the bar is translated directly into pounds on the dial. Approximately 0.039 in. is all that is required to give a full-scale deflection. Accuracy is 1% of indicated reading.

Accidental overloads up to 25% may be sustained without injury to the instrument. Anvil may be unscrewed if desired to mount directly into a mechanical assembly.

Available in capacities from 10 to 2500 lbs, the gages are about 4½ in. long by 2⅛ in. wide, and weigh about 2½ lbs. Kilogram calibration is optional.

W. C. Dillon & Co., Inc., 1421 S. Circle Ave., Forest Park, Ill.



Studer Profile Grinder Uses Tracer Guide

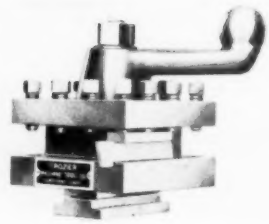
The increased capacity of this machine permits grinding profiles up to 12 in. long on one setting; and flat pieces up to 4⅜ in. thick. Round pieces can be handled up to 10 in. dia. The maximum length of templet is 24 in. The pantograph is adjustable from 1:1 to 1:10. Depending on the accuracy of the templets, profiles can be ground to a tolerance of ± 0.0002 in.

The grinder, with suitable attachments, can be used for relief-grinding of the profiles of punching and drawing dies; and for grinding clearance angles of flat form tools from the templets without distorting the profiles.

An automatic tracer guide attachment for guiding tracer along the templet is available as auxiliary equipment. The uniform feeding produces improved surface finishes and increases the life of the grinding wheels. Loosening two screws of this attachment permits guiding tracer bar by hand.

The Profile Grinder is made by Fritz Studer Ltd., Thum, Switzerland.

Cosa Corp., 405 Lexington Ave., New York 17, N. Y.

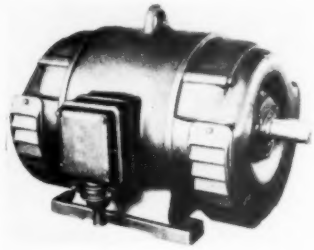


Crozier Toolpost Turret Has 12-Position Index

A 12-position index allows this turret to be aligned to the work with a compound rest of the lathe set at any 30° increment. The turret eliminates the need of ordinary toolholders and requires less setup and down time. It comes with a cutoff tool and holder which may be removed to allow the use of four regular tools.

The turret is available in three sizes. Model 61 with a body 5 5/8 in. sq., Model 41 with a body 4 in. sq., Model 31 with a body 3 in. sq. All are made from hardened steel and equipped with 12-position indexing.

Crozier Machine Tool Co., Hawthorne, Calif.

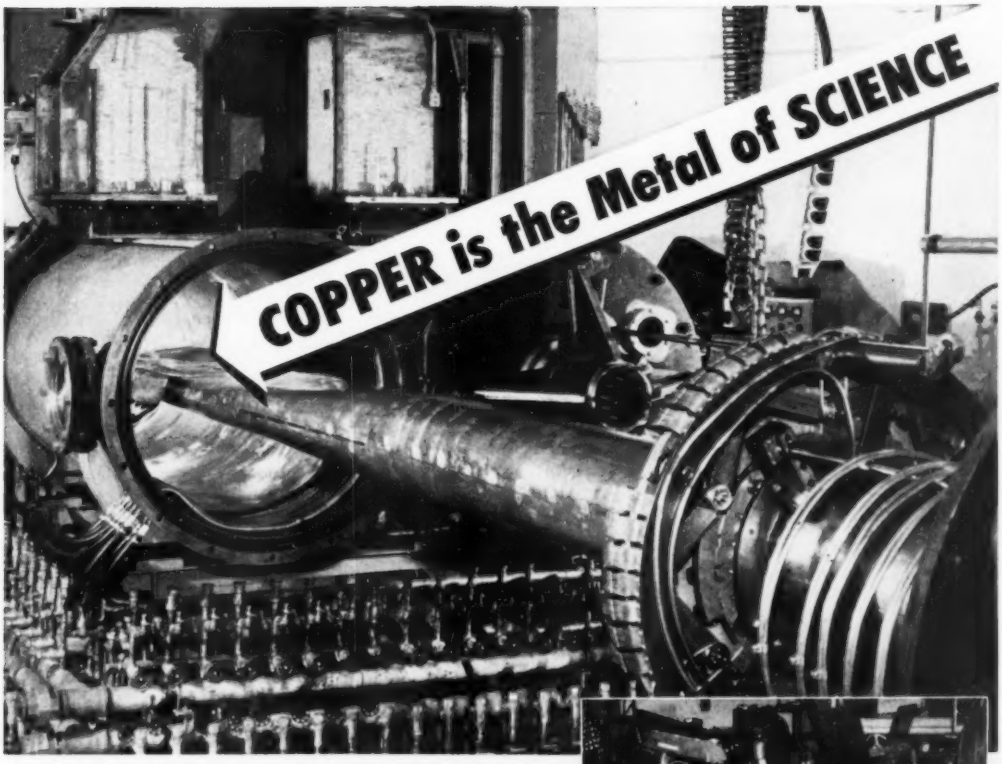


Brake-and-Drive Motor For Frequent Starts and Stops

This quick-stop motor which is a combination brake-and-drive unit was designed for use as initial equipment or for replacement where frequent starts and stops are required. No outside power source or special controls are needed for applying or releasing the brake. When power is cut, it brakes and stops with 150% of normal torque. There is no creep or backlash.

Mounting may be horizontal or vertical for forward or reversing operations. Available from 0.3 to 8 hp in drip-proof and 0.2 to 4 hp totally enclosed. Applications include setting-up, adjusting and feeding motors of machine tools, winches.

Brown Boveri Corp., 19 Rector St., New York 6, N. Y.



D and D Stem being inserted in Cyclotron; made of Revere Electrolytic high-conductivity copper, hot rolled and annealed, ⅛" thick. Note also large number of bronze valves to control flow of cooling water through brass pipe.

● For many years Revere has been saying that "Copper is the metal of invention." It has high electrical and heat conductivity, excellent resistance to corrosion, is easily fabricated and formed, so that it is attractive to designers and inventors, as well as to manufacturers. Now we say it is also "The metal of science," because it is so essential to the operation of most scientific devices.

The pictures on this page illustrate some of its uses in a cyclotron, built by and for the Nuclear Physics Laboratory of the University of Washington in Seattle. The instrument was designed and constructed so far as possible by University personnel, who were completely successful in working copper into the most complicated shapes.

Revere collaborated on the project in various ways, and furnished copper bar, sheet, rod and tube to the University's high specifications. Remember that Revere will be glad to consult with you on your problems concerning copper and copper alloys, and aluminum alloys.

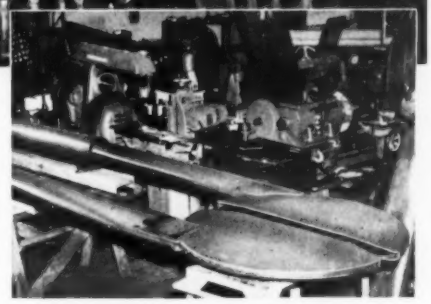
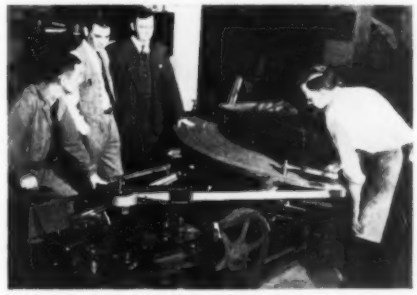


Photo taken in the University of Washington shop during fabrication of the two Ds and D Stems.



Seven miles of Revere copper bus bar were wound into great coils for the cyclotron electromagnet. The University built the winding machine itself, and wound the coils in its own shop. The special Revere bar is soft temper, free from scale, with rounded edges.

REVERE 150th YEAR OF SERVICE TO AMERICA

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N. Y.

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Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.—Sales Offices in Principal Cities, Distributors Everywhere

SEE "MEET THE PRESS" ON NBC TELEVISION EVERY SUNDAY

Improved Motor and Driveshaft Used on Industrial Cleaner

An industrial cleaning machine that will clean and dry the smallest parts made and used in industry now features an improved motor and drive shaft.

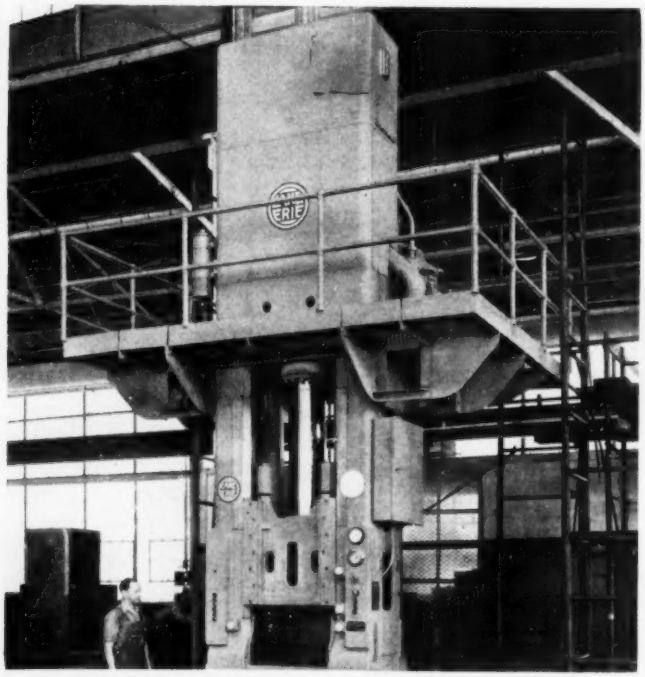
The motor is a universal series wound, rheostat controlled, having a 10-to-1 ball-bearing gear reduction. The driveshaft is made of stainless steel. The motor may be reversed for more effective cleaning by means of a toggle switch. Widely spaced bearings help to keep the work basket concentric.

Aluminum splash pans under each glass jar prevent possible spilling of the solution onto the base of the machine and affecting the wiring if the jars are overloaded.

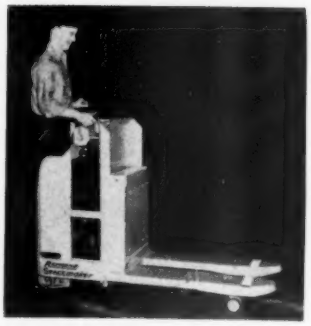
The machine measures 23 in. in height, 16½ in. wide, and 17¼ in. long. To segregate small parts, triple nesting baskets are used, fitting into the monel mesh work basket. Glass jars are 1-½ gallon capacity. A chromalox heater unit and a separate motor-driven blower in the drying chamber assure complete drying of the parts cleaned.

The centrifugal action of the basket keeps the parts stationary and prevents their damaging each other.

L & R Manufacturing Co., 577 Elm St., Arlington, N. J.



HYDRAULIC PRESS of 200-ton capacity is designed for the first draw on 105-mm cartridge cases from cold-drawn steel. The press has a bed area of 30x30 in., daylight opening of 66 in. and 48-in. stroke. It stands 22 ft above the floor and is powered by a 125-hp motor. It is the first hydraulic press built specifically for current ordnance.—*Lake Erie Engineering Corp., Buffalo 2, N. Y.*



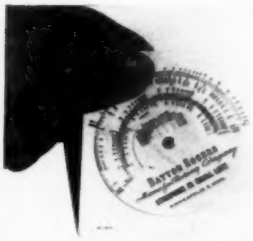
Electric Pallet Truck Allows Operator to Ride

This low-lift pallet truck handles both single and double-face pallets. Known as the Spacemaker Low-Lift, it speeds up handling by allowing the operator to ride while picking up and delivering. It travels up to 5 mph when carrying 4000-lb loads, and up to 5 mph when empty.

The truck can right-angle pick up or spot loads from aisles as narrow as 6 ft. The carrying frame can be from 30 to 60 in. in length, and 24, 27 or 30 in. in width. Over-all length of power unit and riding area is 28 in.

Forks may be raised from 3¼ to 7¼ in. high. It uses either 250-440 amp-hr, 6-cell lead batteries or a 300-amp-hr, 10-cell Edison battery in a standard battery compartment.

Lyon-Raymond Corp., 47-83 Madison St., Greene, N. Y.

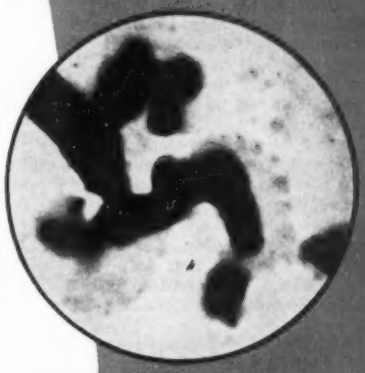


Sheet-Metal Weight Calculator

This device is able to determine weight of steel, aluminum, iron, copper, bronze, and lead sheets. The thickness is set opposite the width and the weight will be opposite the length. The calculator is made of celluloid, and may be carried in the pocket. It may be obtained free of charge when making requests on company letterhead.

Dayton Rogers Mfg. Co., 282½ 15th Ave. South, Minneapolis 7, Minn.

scoop for blitzing bacteria—DOWICIDE PRODUCTS



Bacteria Extracted from Coating Material

When you use Dowicide products to "blitz" bacteria and mold out of cutting oils and coolants, you'll reduce machine down-time and material wastes that result when soluble oils go "sour."

Monday morning ... emulsion breakdown, discoloration and oil separation—all these are signs that bacteria and mold are growing in the emulsion. And the results of such growths: rusted parts and machines, clogged pipes and drains, together with the extra man hours required to correct the condition, are costly indeed.

You can insure yourself against these added production expenses and gain greater service life from soluble oil emulsions by the incorporation of Dowicide industrial germicides and fungicides. They are easy to use and are available in oil and water-soluble types.

If you are not already profiting from their use, investigate this profitable means of bringing microbial control into your plant today.

Dow maintains complete laboratory facilities to help you solve your problems. Contact our nearest sales office or write direct to Midland for additional information on Dowicide products.

Use
DOWICIDE
INDUSTRIAL
GERMICIDES and
FUNGICIDES

THE DOW CHEMICAL COMPANY
MIDLAND, MICHIGAN

New York • Boston • Philadelphia • Washington
Atlanta • Cleveland • Detroit • Chicago • St. Louis
Houston • San Francisco • Los Angeles • Seattle
Dow Chemical of Canada, Limited, Toronto, Canada

DOW
CHEMICALS
INDISPENSABLE TO INDUSTRY
AND AGRICULTURE

Unit Gives Finger-Tip Control Of Motor Speed to 5000 rpm

The unit consists of a special motor and companion control box operating from a 115-v, 60-cycle line. The combination provides complete control of the motor speed from 50 to 5000 rpm. A front-panel meter, calibrated in rpm, gives the motor speed directly.

The action of the control is to maintain the speed approximately constant at the control-knob setting, regardless of variations in the load demand torque. The motor will deliver up to 10-in.-oz torque at any in-between speed.

The motor is ruggedly built to close tolerances, suitable for either flange or base mounting. It is said to be useful in industrial applications as the drive in coil-winding machines, conveyor belts, textile spinning and weaving. It is adaptable to machine tools controlling feed rates, and cutting and grinding speeds.

Industrial Control Co., 1462 Undercliff Ave., New York 52, N. Y.

Spot Welding and Soldering Of Small Products Speeded Up

Designed for the small-product manufacturer, a resistance spot welding and soldering machine is said to speed production, cut costs, and eliminate shrinkage in the manufacturing of instruments. It solders or welds in less than a second.

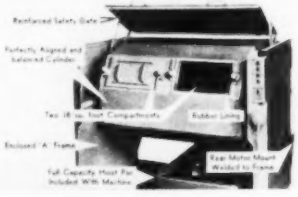
The machine will also silver-solder, soft-solder, and spot-weld precious and dissimilar metals. Steel parts up to 3/32 in. thick can be spot welded and brass up to ⅛ in. thick can be soldered.

The set-up time for production operation is simple and rapid. Electrodes are designed for each job and are spring-action controlled so that, when electrode arms are closed, work is held firmly in position during soldering and cooling.

An automatic cut-off timer regulates soldering time. Heat control with eleven adjustments determines correct heat for the job. When dials are set, uniform soldering time, heat, and holding pressure on the electrodes are maintained, regardless of how long the foot switch is depressed. Thus, all chance of work burning and consequent shrinkage is eliminated.

Since it leaves no pitting marks, the machine is effective in soldering additional elements to an assembly. It is also applicable to the assembly of fine parts in instruments and electronic components and for spot welding ferrous and non-ferrous metals.

Joyal Products, Inc., 56 Belmont Ave., Newark 3, N. J.



Tumbling Machine Has Jogging Provision

Large quantities of parts are precision finished at one time in the automatically controlled tumbling machine recently developed by the Roto-Finish Co.

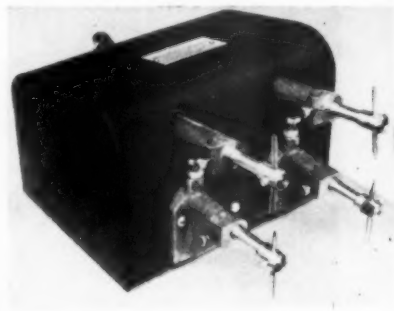
Model DW-60-36-2 is compact and easily accessible for speed of operation and maintenance. It is push-button operated, having all controls conveniently located on one panel. It is equipped for jogging, and has a magnetic reversing starter with 110 v. control transformer. Once the machine is started, an automatic timer will stop its operation any time from 0 to 20 hrs. It also has a 5 hp variable speed power unit with a remote control handle for adjusting the speed of the cylinder from 10 to 30 rpm.

A safety switch prevents the machine from operating should the reinforced safety gate be raised. Spring-loaded releases are used to prevent excessive pressure build-up within the machine. The machine's motor is mounted in the rear for safety, motor protection, and maintenance ease.

The machine's two compartments each have a capacity of 18 cu ft. It is built of 3/16 in. steel, with supports, mounts, and base an integral part of the frame. Bolting to the floor is unnecessary. Heavy channel-A supports are fully enclosed to prevent lodging of chips and make the machine easier to clean and maintain.

Cylinder shafts are mounted in ball bearing pillow blocks, and doubly supported with gussets and bells. The hoist-pan system of loading and unloading is used.

Roto-Finish Co., Kalamazoo, Mich.



Variable Electrode Pressure On Double Welding Head

A double head for bench welding has been added to Federal's Tweezer-Weld line. Pressure is applied through a cam acting against the variable deflection of a cantilever spring. The combination of cam and cantilever spring provides automatic follow-through pressure — instantaneously. Independent switches are used for each pair of electrodes as well as independent treadles. The electrode pressure is variable from 6 oz to 15 lb by micrometer adjustment.

The Tweezer-Weld action is used for the first time in bench heads. Operating speed is said to be up to 3600 welds per hr. Also available in single head. Minimum bench space is all that is required for line-assembly.

Federal Tool Engineering Co., 532 Mulbery St., Newark, N. J.

"STANDARD" recommends STANDARDS*

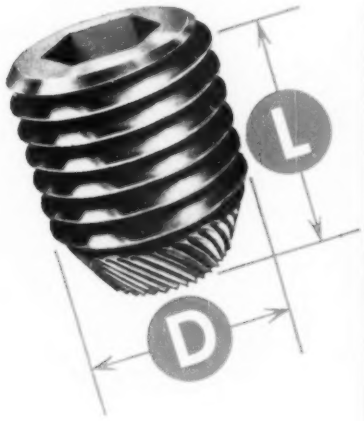
UNBRAKO®

SELF-LOCKING SOCKET SET SCREWS (WITH KNURLED CUP POINT)

STANDARD SIZES

Sizes preceded by asterisk (*) available in both National Coarse and National Fine Threads

Class 3 fit is an "UNBRAKO" standard



The unique, counter-clockwise *knurls* on the UNBRAKO Cup Point make these screws *self-locking*, prevent "creep" and subsequent loosening. And, UNBRAKO Set Screws with the Knurled Cup Point "stay put" even in poorly tapped holes — an important factor in reducing machinery stoppage and production losses.

★ One of a series listing *Standard* UNBRAKO Socket Screw Products sold by your local UNBRAKO Distributor. If you want reprints of this and other advertisements in the series, ask for them on your business letterhead.

D Diameter	Threads per inch NC	Threads per inch NF	L Overall Length	Price per 100	Quantity per box
#4 (.112")	40	48	* 1/8	3.95	100
	40	48	* 3/16	4.00	100
	40	48	* 1/4	4.05	100
	40	48	* 5/16	4.10	100
	40	48	* 3/8	4.20	100
	40		7/16	4.40	100
	40		1/2	4.70	100
	40		5/8	5.00	100
#5 (.125")	40	44	* 1/8	4.00	100
	40	44	* 3/16	4.05	100
	40	44	* 1/4	4.10	100
	40		5/16	4.15	100
	40		3/8	4.25	100
	40		7/16	4.45	100
	40		1/2	4.75	100
	40		5/8	5.05	100
	40		3/4	5.35	100
#6 (.138")	32	40	* 1/8	4.05	100
	32	40	* 3/16	4.10	100
	32	40	* 1/4	4.15	100
	32	40	* 5/16	4.20	100
	32	40	* 3/8	4.30	100
	32		7/16	4.50	100
	32		1/2	4.80	100
	32		5/8	5.10	100
	32		3/4	5.40	100
	32		7/8	5.70	100
	32		1	6.00	100
#8 (.164")	32	36	* 1/8	4.10	100
	32	36	* 3/16	4.15	100
	32	36	* 1/4	4.20	100
	32	36	* 5/16	4.25	100
	32	36	* 3/8	4.35	100
	32		7/16	4.55	100
	32	36	* 1/2	4.85	100
	32		5/8	5.15	100
	32		3/4	5.45	100
	32		7/8	5.75	100
	32		1	6.05	100
#10 (.190")	24	32	* 3/16	4.20	100
	24	32	* 1/4	4.25	100
	24	32	* 5/16	4.30	100
	24	32	* 3/8	4.40	100
	24	32	* 7/16	4.60	100
	24	32	* 1/2	4.90	100
	24	32	* 5/8	5.20	100
	24	32	* 3/4	5.50	100
	24		7/8	5.80	100
	24	32	*1	6.10	100
	24	32	*1 1/4	6.65	100
1/4 (.250")	20	28	* 3/16	4.30	100
	20	28	* 1/4	4.35	100
	20	28	* 5/16	4.40	100
	20	28	* 3/8	4.50	100
	20	28	* 7/16	4.70	100
	20	28	* 1/2	5.00	100
	20	28	* 5/8	5.35	100
	20	28	* 3/4	5.70	100
	20		7/8	6.05	100
	20	28	*1	6.40	100
	20	28	*1 1/4	7.10	100
	20		1 1/2	7.80	100
	20		1 3/4	8.50	100
	20		2	9.70	100
5/16 (.3125")	18	24	* 1/4	4.45	100
	18	24	* 5/16	4.50	100
	18	24	* 3/8	4.60	100
	18	24	* 7/16	4.80	100
	18	24	* 1/2	5.10	100
	18	24	* 5/8	5.50	100
	18	24	* 3/4	6.00	100
	18		7/8	6.50	100
	18	24	*1	7.00	100
	18	24	*1 1/4	7.60	100

D Diameter	Threads per inch NC	Threads per inch NF	L Overall Length	Price per 100	Quantity per box
5/16 (.3125")	18		1 1/2	8.40	100
	18		1 3/4	9.20	100
	18		2	10.50	100
3/8 (.375")	16	24	* 1/4	4.55	100
	16	24	* 5/16	4.60	100
	16	24	* 3/8	4.70	100
	16	24	* 7/16	4.90	100
	16	24	* 1/2	5.20	100
	16	24	* 5/8	5.60	100
	16	24	* 3/4	6.20	100
	16		7/8	6.80	100
	16	24	*1	7.40	100
	16	24	*1 1/4	8.20	100
	16		1 1/2	9.20	100
	16		1 3/4	10.50	100
	16		2	12.50	100
	16		2 1/2	14.50	100
7/16 (.4375")	14	20	* 3/8	5.90	100
	14	20	* 7/16	6.10	100
	14	20	* 1/2	6.40	100
	14		5/8	6.80	100
	14		3/4	7.40	100
	14		7/8	8.00	100
	14		1	8.70	100
	14		1 1/4	9.50	100
	14		1 1/2	11.00	100
	14		1 3/4	12.50	100
	14		2	14.00	50
	14		2 1/2	16.50	50
1/2 (.500")	13		3/8	6.90	100
	13		7/16	7.10	100
	13	20	* 1/2	7.40	100
	13	20	* 5/8	7.80	100
	13	20	* 3/4	8.40	100
	13		7/8	9.00	100
	13	20	*1	9.70	100
	13		1 1/4	10.50	100
	13		1 1/2	12.00	100
	13		1 3/4	13.50	50
	13		2	15.00	50
	13		2 1/2	17.50	50
	13		3	20.00	50
5/8 (.625")	11		1/2	9.90	100
	11	18	* 5/8	10.30	50
	11		3/4	10.90	50
	11		7/8	11.50	50
	11	18	*1	12.50	50
	11		1 1/4	13.50	50
	11		1 1/2	14.50	50
3/4 (.750")	10		5/8	12.80	50
	10		3/4	13.40	50
	10		7/8	14.00	50
	10		1	15.00	50
	10		1 1/4	16.00	50
	10		1 1/2	18.00	50
	10		1 3/4	20.00	50
	10		2	23.00	25
	10		2 1/2	27.00	25
	10		3	31.00	25
7/8 (.875")	9		7/8	17.00	25
	9		1	18.00	25
	9		1 1/4	20.00	25
	9		1 1/2	22.00	25
	9		1 3/4	25.00	25
	9		2	29.00	25
	9		2 1/2	34.00	25
	9		3	39.00	25
1 (1.000")	8		1	23.00	25
	8		1 1/4	25.00	25
	8		1 1/2	28.00	25
	8		1 3/4	32.00	25
	8		2	36.00	25
	8		2 1/2	42.00	25
	8		3	48.00	25

Prices subject to change without notice.

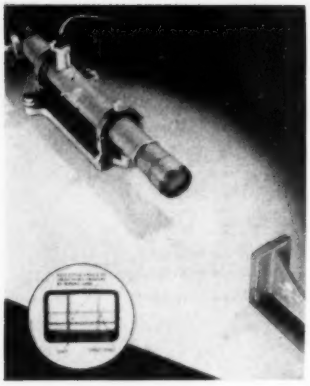
LIST PRICES SUBJECT TO DISCOUNT

SPS

STANDARD PRESSED STEEL CO.

JENKINTOWN 1, PENNSYLVANIA

Most tapped holes are *standard*, why specify "special" screws? Use UNBRAKO *standards!*



Microptic Auto-Collimator Precisely Measures Displacement

The English-made, 18-in. Auto-Collimator determines and checks straightness, squareness, and inclinations to ½ second of arc (0.0000025 per in. of length). It operates on the optical principle that a beam of light reflected by a mirror is deflected if the mirror is tilted and that the angle through which the reflected beam is turned is twice the angle of tilt of the mirror.

Through the micrometer eye piece of the instrument a reflected image of reference lines can be observed by which tilt is determined to an accuracy of a fraction of a second of arc.

A yellow filter and convenient scale provide for precise and comfortable reading. It is said to be widely used in the machine-tool industry for gage and fixture inspection and for testing precision mechanisms.

Through the use of auxiliary accessories, a number of extremely accurate angular measurements can be made which can conveniently be converted into precise distance measurement.

Engis Equipment Co., 431 S. Dearborn St., Chicago, Ill.

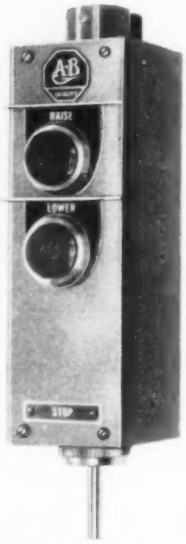
Roller-Bearing Center for Lathe and Grinder Tailstocks

These centers have two matched Timken roller bearings, giving them high load-carrying capacities. A threaded retainer ring preloads the bearings and provides adjustment for bearing wear.

The spindle is made from alloy steel hardened to Rockwell C 64 with a point ground after assembly. Maximum run out of 0.0002 in. is claimed. A labyrinth grease seal has a rotating neoprene ring. The grease port has a 1/8-in. pipe thread at rear of shank for standard grease fitting. It also allows insertion of a threaded rod for rotating spindle when redressing point.

The centers are available in standard Morse-taper sizes from stock. Jarno, Brown & Sharpe, and Hendey tapers, straight shanks, and special spindles made to order.

Falls Products, Inc., Genoa, Ill.



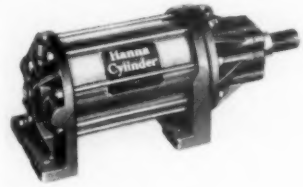
Allen-Bradley Pendant Control Station

The pendant push-button station is an oiltight control station designed for use as a portable control. It can also be used for suspension above a machine for easy accessibility to the operator.

The stations are available in sizes having three units including the stop, to 10 units including the stop. Standard stop unit is a wobble stick in the bottom of the enclosure, but can also be furnished as a mushroom head mounted in the bottom or in the front of the enclosure. Each enclosure has a cable anchor at the top.

Special pendant control stations can be built with any combination of pilot lights and push-button selector-switch jogging or key-operated units.

Allen-Bradley Co., Milwaukee, Wis.

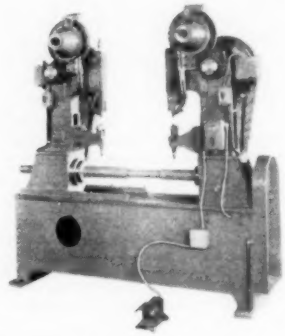


LP Cylinder Operates on Air, Oil, or Water

Hanna low-pressure cylinders are designed for operation up to 110 psi, and with minor modifications can take higher pressures depending on the cylinder diameter and the operating medium which can be either air, oil, or water.

Design features include: a cork floater ring which facilitates cushion alignment with the head, insuring a seal during cushioning; spring-backed chevron rod packings which are self-adjusting for consistently correct compression; and the flange design which permits removal of the front head without disturbing the mounting.

Hanna Engineering Works, 1764 Elston Ave., Chicago 22, Ill.



DUAL RIVITOR saves time and labor in assembly and riveting by automatically feeding and setting two ¼-in.-dia, ⅝-in.-long rivets at a time. The machine consists of two 8-in. Rivitors, mounted face to face on a common base, adjustable for rivet spacings from 2½ to 18 in. center to center. One motor drives both flywheels, synchronized by a combination gear and chain drive arrangement. Both clutches are tripped by solenoids from a single foot switch.— ***Tompkins-Johnson Co., Jackson, Mich.***

"no more GAMBLING on tool steel selection"

(½ actual size; Selector is in 3 colors)

Here's how it works:

To use the Selector, all you need know is the characteristics that come with the job: type and condition of material to be worked, the number of pieces to be produced, the method of working, and the condition of the equipment to be used.

FOUR STEPS—and you've got the right answer!

1. Move arrow to major class covering application
2. Select sub-group which best fits application
3. Note major tool characteristics (under arrow) and other characteristics in cut-outs for each grade in sub-group
4. Select tool steel indicated

That's all there is to it!

Here's an example:

Application—Deep drawing die for steel

Major Class—Metal Forming—Cold

Sub-Group—Special Purpose

Tool Characteristics—Wear Resistance

Tool Steel—Airdi 150

One turn of the dial does it!

And you're sure you're right!!

Since the first announcement, hundreds of tool steel users have received their CRUCIBLE TOOL STEEL SELECTORS. The comments received indicate that this handy method of *picking the right tool steel right from the start* is going over big.

"Handiest selector I've ever seen"

"No more gambling on tool steel selection"

"You're right, the application should dictate the choice of the tool steel" . . . and many, many more favorable comments.

You'll want your CRUCIBLE TOOL STEEL SELECTOR. It uses the only logical method of tool steel selection—begin with the application to pick the right steel! And the answer you get with one turn of the Selector dial will prove satisfactory in every case, for the CRUCIBLE TOOL STEEL SELECTOR covers 22 tool steels which fit 98% of all Tool Steel applications. ALL the tool steels on the Selector are in Warehouse Stock . . . that means when you get the answer, you can get the steel . . . fast!

Write for your Selector today! We want you to have it, because we know you've never seen anything that approaches your tool steel problems so simply and logically. Just fill out the coupon and mail. Act now! CRUCIBLE STEEL COMPANY OF AMERICA, Chrysler Building, New York 17, N. Y.

Crucible Steel Company of America
Dept. A, Chrysler Building
New York 17, N. Y.

Gentlemen:

Sure! I want my CRUCIBLE TOOL STEEL SELECTOR!

Name _____ Title _____

Company _____

Street _____

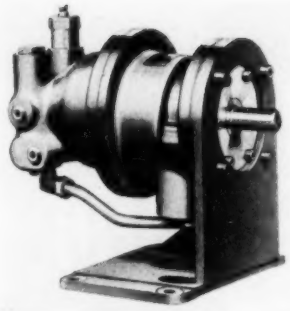
City _____ State _____

CRUCIBLE first name in special purpose steels

TOOL STEELS

fifty-one years of Fine *steelmaking*

Branch Offices and Warehouses: ATLANTA • BALTIMORE • BOSTON • BUFFALO • CHARLOTTE • CHICAGO • CINCINNATI • CLEVELAND • DENVER • DETROIT HOUSTON, TEXAS • INDIANAPOLIS • LOS ANGELES • MILWAUKEE • NEWARK • NEW HAVEN • NEW YORK • PHILADELPHIA • PITTSBURGH • PROVIDENCE ROCKFORD • SAN FRANCISCO • SEATTLE • SPRINGFIELD, MASS. • ST. LOUIS • SYRACUSE • TORONTO, ONT. • WASHINGTON, D. C.



Oilgear's High-Pressure, Constant-Delivery Pumps

Simplification and compactness are emphasized in these Oilgear pumps. With fewer working parts, and flood lubrication by the oil, they operate quietly at speeds up to 1800 rpm. They handle pressure up to 3000 and 5000 psi.

The heavy-duty units have a fixed stroke, the volume of oil delivered varying with the drive-shaft speed. Oil is delivered in one direction. Each unit consists of an axial rolling piston pump, a supercharging gear pump, a gear-pump relief valve, and an adjustable reverse-flow high-pressure relief valve. Over 10 hp is transmitted. About 135-cipm excess gear-pump oil at 100 psi is available for auxiliary purposes. Pump, work, and machine are protected against overload.

The pumps are suitable for pushing, pulling, lifting and lowering applications, for maintaining high static loads on large clamping rams, for repetitive cycles, and where controlled variable speed is not essential.

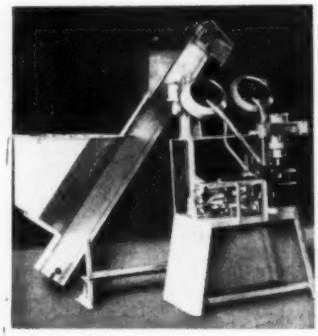
The Oilgear Co., Milwaukee 1, Wis.

Post Electronic Counter Gives Total Rate, Predetermined Count

The Post Machinery Co., in collaboration with the General Control Co., have designed this unit for counting in several variations, including total count, rate of count, and pre-determined count. The unit can count up to 10,000 units per sec. Operation may be cumulative or predetermined. High-speed count is obtained through the use of photocell and electronic circuits. The device automatically energizes an external circuit for the purpose of segregating batches at the end of the pre-determined count.

A visual 6-digit totalizer indicates the exact count, while a rate meter continuously shows the rate of count per hr. The counter may be mounted as much as 75 ft. away from the photocell head. Operation is 115v, 60 cycles.

Post Machinery Co. Div., Reid Bros., Beverly, Mass.



Machine Automatically Assembles Clutch Plates

Designed to place springs in clutch-plate cavities, the machine uses separate hoppers containing holding rivets and for the springs themselves. Two rivets are automatically fed to the spring and placed in each end. The spring is dropped from a separate hopper to make the assembly cycle completely automatic. The assembled springs and rivet assemblies are forced into the cavity by a hydraulic press. An air-operated indexing fixture rotates the clutch plate each time a cavity is filled.

The machine can be adapted to any size clutch plate with varying requirements as to the number of spring assemblies needed. Conveyors can be supplied to carry the parts from bins to hopper. The machine handles 300 plates per hr with six assemblies to a plate.

The Klass Machine & Mfg. Co., 4328 E. 49th St., Cleveland 25, Ohio.

A synthetic-rubber flooring material recently marketed by Flash-Stone Co. is said to have exceptional strength and long life, a high resistance to acids, alkalis, water, and other destructive agents, and low cost and ease of application. Called Vulcrete, it dries to a light concrete color, and bonds inseparably with wood, metal, concrete, and other bases of similar composition. It has a high resistance to point loads of weight.

In industrial applications it is used for leveling and resurfacing all worn, or splintered floors. It is a pronounced sound dampener when used over steel plates, and is a versatile maintenance material for general patching, waterproofing, pointing, etc.

Flash-Stone Co., Inc., 30 E. Rittenhouse St., Philadelphia 44, Pa.

FO-106, solvent-emulsion cleaner (a concentrate) was developed to meet the needs of industrial users who find cresylic acid odors and skin burns troublesome. It meets the requirements of Air Force Spec. 20015E and Navy Spec. C-147, type I.

It is intended to be diluted with kerosene or Stoddard solvent in proportions from 4 to 9 parts solvent to 1 part compound. It is applied to metal, concrete, or painted surfaces by brush or spray in diluted form, then rinsed off with hot or cold water. No oily film remains. Dirt and grease are emulsified and carried off in the rinse. Painted surfaces are not harmed.

The emulsion is said to be highly satisfactory for parts cleaning and soaking to remove greasy deposits when used either in dip tanks or hydro-wash machines. FO-106 may be diluted with water and can be heated to 160 F for spray cleaning in process work. It is available in 5-and 53-gal drums.

Aviation-Industrial Division of Fine Organics, Inc., 211 E. 19th St., New York 3, N. Y.

One-Coat Heat-Resistant Lacquer

A one-coat, heat-resistant lacquer, C 5173, originally developed for photographic lighting apparatus, may be used wherever temperatures up to 300 degrees are encountered.

Within this range, the lacquer provides excellent color retention and resistance to cracking or peeling. It may be applied in a single coat, giving excellent adhesion to all metals, including steel and aluminum. The lacquer air dries in 15 minutes.

It is available in all colors, in flats, semi-gloss and gloss.

United Lacquer Mfg. Co., 1001 W. Elizabeth Ave., Linden, N. J.

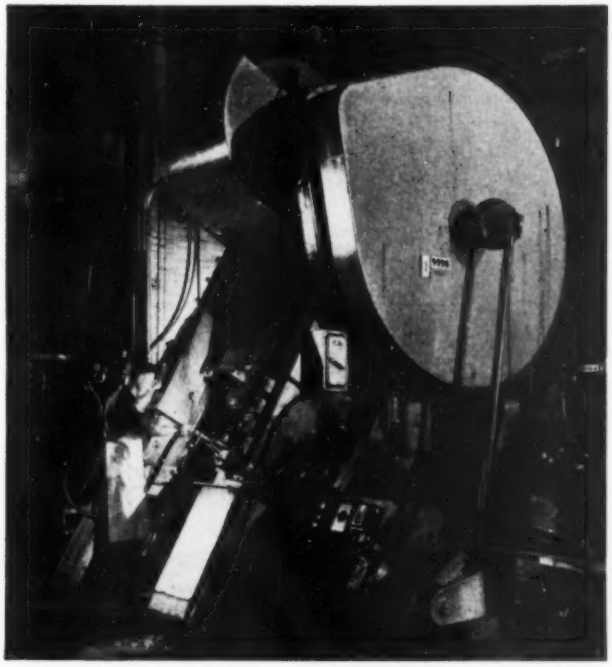
1/3 Billion Pieces

. . . CLUTCH EXPENSE $0.00

MINSTER Press
Performance Report
No. 40E-9-3782
• 400 tons
• Single Crank Straight Side Press
• Single geared
• Stroke, 5"
• Strokes per minute, 33
• Bed area, 48" x 39"
• Permanently inclined
• Equipped with Minster air-operated combination friction clutch and brake unit

Below . . . Minster Press No. 40E-9-3782 on day of shipment 1943. Flywheel and drive shaft run on Timken tapered roller bearings.

Right . . . Same press today. Used to blank and draw roller bearing cage cups out of high carbon steel strip. *Photo courtesy The Timken Roller Bearing Company, Canton, Ohio.*



Minster Press at The Timken Roller Bearing Company produces 349,440,000 pieces, 1/3 operations single stroke . . . runs 29,120 production hours . . . WITH NO DOWNTIME, LABOR OR PARTS COST DUE TO CLUTCH REPAIRS.

Why is it that this remarkable clutch record at The Timken Roller Bearing Company really isn't so remarkable . . . for a Minster press?

Why is it our files are loaded with clutch performance records of 8 . . . 10 . . . 14 years with repair costs nonexistant or extremely low?

Why is it that the press clutch . . . often a source of expense and irritation . . . is in the case of Minster something that can almost be ignored year after year?

The answer lies in design superiority, producing not only low maintenance costs but higher speeds . . . longer die life . . . greater accuracy . . . unusual versatility. In fact, Minster today is accomplishing results once thought impossible to obtain with a power press.

Have the many advantages of Minster presses and Minster's Air-operated Combination Friction Clutch and Brake Unit been explained to you recently? Tremendous strides have been made that will make it worth your time to write, wire, or telephone.

MINSTER
FIRST IN *Press* DESIGN

THE MINSTER MACHINE COMPANY, MINSTER, OHIO

OUT OUR WAY

OH, BALONEY! YOU'RE LIVIN' IN THE OLD HORSE AN' BUGGY DAYS! A MOSSBACK OF THE OLD MUSTY MAUVE DECADE!
YEAH? WELL, IT'S TH' OL' BOYS OF TH' MUSTY MAUVE THAT MADE IT POSSIBLE FER YOU TO HAVE WHUT LITTLE BRAINS YOU GOT! WHO INVENTED ALL TH' MODERN CONVENIENCES--SOME JITTERBUG LIKE YOU? HAH!
HE'S RIGHT-- YOU HAD TO RIDE IN AN OXCART TO WANT SOME-THIN' BETTER ...THIS GENERATION IS GETTIN' TOO COMFORTABLE, I THINK!
THERE'S ONE IMPROVEMENT THEY AGREE ON, THOUGH-- SOL-SPEEDI-DRI! TH' BOY IS SORE BECAUSE IT WAS OLD JOE WHO FIRST THOUGHT TSEND FOR A SAMPLE!
J.R. WILLIAMS
THE OLD AND THE NEW

More for the money made it sales leader

SOL-SPEEDI-DRI

It's no accident when a product leads its field. SOL-SPEEDI-DRI is—and always has been—America's largest selling oil and grease absorbent. Big users and independent laboratories have tested it. We are constantly testing it. All factors considered, SOL-SPEEDI-DRI gives you *more for your money*. Send coupon today for free sample and brochure about how to keep *your* floors clean and slip-proof with SOL-SPEEDI-DRI!

SPEEDI-DRI CORP., 210 W. Washington Sq., Philadelphia 5, Pa.

Warehouse stocks maintained in principal cities of the United States and Canada.

• • •

Inquirers in New York, New England, and New Jersey should write to Speedi-Dri Corp. Elsewhere in U.S. to Waverly Petroleum Products Co., 1724 Chestnut St., Phila. 3, Pa.

FREE SAMPLE: Fill out the coupon and mail today for big, free sample and brochure.

Name_____

Address_____

City_____ State_____

AM-9-51

ROUND TABLE Discussion

PACK RATS

"STEALING," said a plant foreman, "is my hardest problem. Some of the guys in my department get away with the damnedest lot of stuff you ever heard of."

Parts stealing seems to continue year after year, but there are many ways a foreman can minimize it. In a good-sized plant, one foreman was always loyal to his men. He was so well liked that those under his direction had a high regard for him. He claimed that he had never known a man in his department to steal anything.

As an occasional new man came into his department he had a friendly talk with the beginner and explained that any irregularity was a black eye to him (the foreman), to the men, and to his part of the organization, especially if it was a matter of theft.

Pilfering and downright robbery will never be entirely prevented. Systems of detection have been instigated, the result of which have been the discharge of the offender or his arrest but even these have never been satisfactory.

Thievery can never be entirely overcome unless the human race changes.

F. H. Stebbins
Worcester, N. Y.

•

THEIRS NOT TO REASON WHY

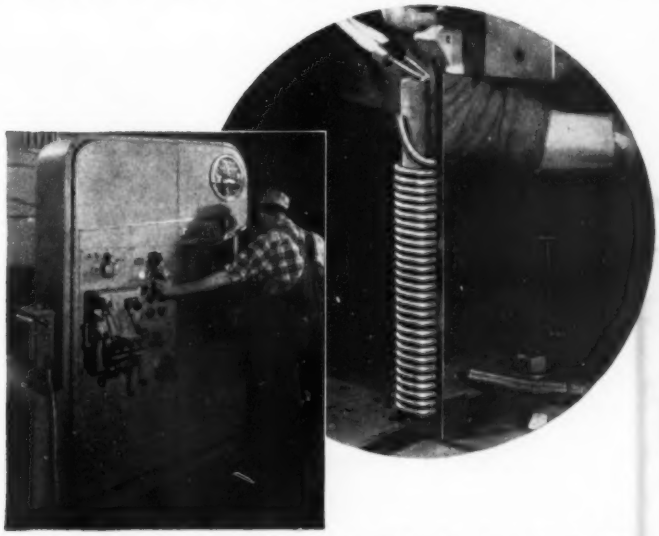
THE TEST of a foreman faced with making a decision affecting another department is to think the thing through and bring the matter to a head. The best interests of the company demand that the best product be manufactured. And if any doubt exists as to feasibility of bringing improvements in design to the attention of the engineering department, the guiding principle should be whether the best interests of the company will be served if this information is withheld.

The foreman faced with such a decision has three alternatives: to let the matter alone and ask no questions, take it up with an intermediary who apparently will not bring it to the attention of the proper authority, or take his courage in his own hands and adjust the matter at the highest level he can.

If the foreman's superior was avail-

ELIMINATES COSTLY MILLING OPERATION ON SPLIT RINGS

ECONOMICAL DoALL BAND MACHINING DOES JOB IN 1/3 THE TIME, FREES MILLING MACHINE FOR OTHER WORK



ASK Gates City Iron Works, Omaha, Nebraska, about the DoALL Contour-matic Band Machine! They were cutting split rings from ¼" cold rolled steel coils on an expensive milling machine. A DoALL MP-20 slashed time for the job by two-thirds and released the milling machine for other work.

In this same plant the MP-20 used for friction sawing of thin stainless cut the operation time in half.

You can cut anything with a DoALL MP-20 Contour-matic — any material, any shape. Ask to have a *demonstration* of this versatile, time, money and material-saving machine tool right in your own plant. A DoALL sales service engineer will bring it to you, *show you* what it can do. Call your local DoALL Sales-Service Store or write:

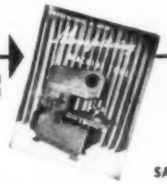
THE DoALL COMPANY • 254 N. Laurel Ave. • Des Plaines, Ill.

BAND MACHINING CAN DO 100's OF JOBS FASTER, AT LOWER COST

DoALL Band Machines cut *continuously* — they slice the material apart, instead of reducing it to a pile of chips. They are fast, they are versatile, they are easy to use. There are DoALL Band Tools for every cutting, filing, grinding, honing and polishing job.

Send for Catalog

Learn about the complete machining facilities offered by this modern band machine.

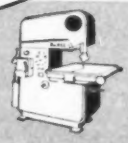


27 SALES-SERVICE STORES

DoALL

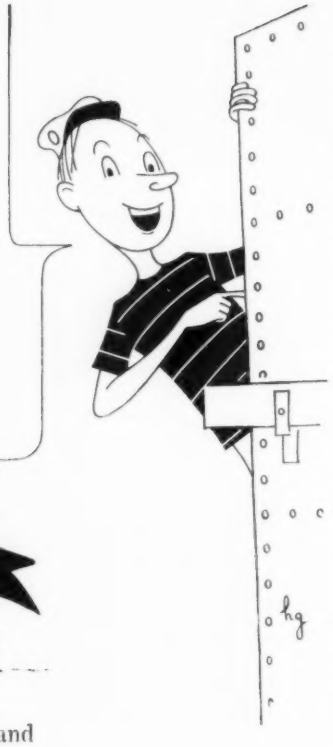
INDUSTRY'S NEW TOOLS

B-1



Machine Tools . . . Gaging Equipment . . . Tool Steel . . . Band Tools . . . Metal Working Supplies

You oughta see JIM'S OPERATION!



SIMONDS ABRASIVE CO.

Grinding Wheels

It's a grinding operation—and a mighty successful one since Jim put Simonds Abrasive Company wheels to work on it. His production count is way up and a big decrease in rejects makes a healthy low-cost record. You'll find everything for your operations in Simonds complete line of grinding wheels, mounted wheels and points, segments and abrasive grains — accurately specified and produced by Simonds Abrasive Company, a major grinding wheel manufacturer for almost 60 years. Write for free data book.

SIMONDS ABRASIVE CO., PHILADELPHIA 37, PA. BRANCH WAREHOUSES: CHICAGO, DETROIT, BOSTON
DISTRIBUTORS IN PRINCIPAL CITIES

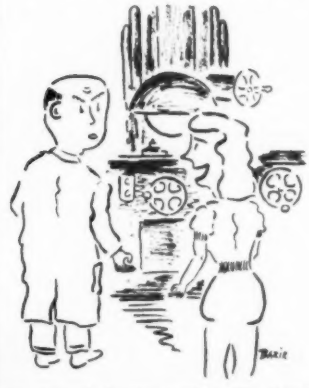
Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N. Y., Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd. Arvida, Que.

able during the job, it would have been proper for him to take the matter through him. It is his job to handle matters with other departments. But the unfortunate absence of the foreman's superior puts the solution of the problem up to the foreman as next in chain of authority in the department.

Teamwork means working in unison toward a common goal, with each person pulling his share of the load. Teamwork is synonymous with cooperation. The foreman has major points of contact in his organization at which he is expected to give and get cooperation. These points are: with management at higher levels, with other departments, and with his workers. However well-done organization planning may be, every possible situation cannot be provided for. When unexpected situations arise, or emergencies occur, then solutions to problems, adjustment of individuals, and reduction of friction are achieved through use of cooperation. Cooperation means working together toward a common goal. It means going beyond the line of duty to do something for someone else. In cooperating with management, and other departments, the foreman can proceed intelligently to the extent to which he is familiar with such company policies as affect his work.

When he discovers certain improvements can be made in design he should not hesitate to bring the matter to the engineering department for further development. He can also give advance information to preceding departments so that they can anticipate his needs and difficulties. The design department should welcome suggestions for improvements in design.

It is not in the best interests of



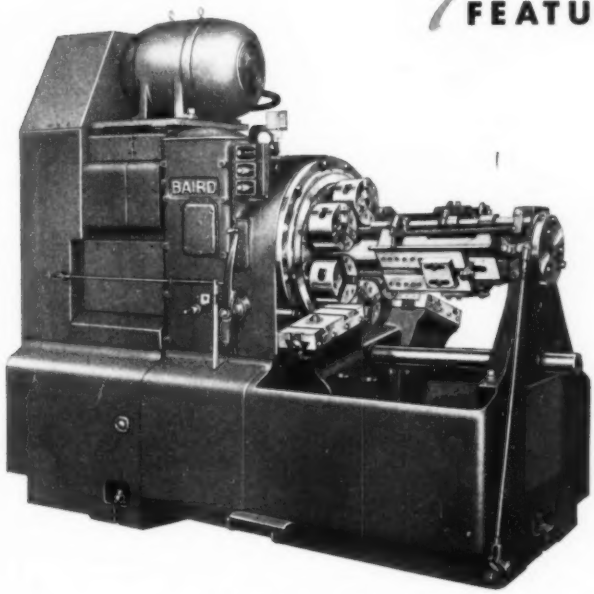
"Is diamond dressing anything like French dressing?"

ASK **BAIRD** ABOUT IT!

HIGH PRODUCTION TOOLING

BAIRD *automatic* CHUCKERS *provide*

7 FEATURES . . THAT SPELL FAST, CLOSE-LIMIT PRODUCTION



- ACCESSIBILITY . . . to all tooling
- VERSATILITY . . . for numerous operations
- ACCURACY . . . maintained for long service life
- SAFETY . . . for machine, operator
- INDIVIDUAL TOOL SLIDES
- INDIVIDUAL Spindle Speeds
- AUTOMATIC CHUCKING . . . both hands free

The 7" chuck, 6 spindle, horizontal machine shown above has a production record that's hard to beat . . . in automotive, aircraft and other industries. It combines in a single automatic indexing cycle such operations as turning, facing, drilling, tapping, threading, grooving, chamfering . . . if desired . . . and performs with great accuracy at highly profitable speeds. All operations are automatic except loading and unloading . . . and both hands of the operator are free for this duty.

Automatic electrical and mechanical safety devices prevent damage when setting up, when loading is not within cycle time or when any motions are out of sequence.

For processing pistons, gears, pulleys, bushings, pump bodies, etc., the Baird 76 H Chucker will pay its way thru high production per man hour, reduced rejects, lower labor cost and increased dollar earnings per square foot of floor space. If you require such repetitive production, ask Baird engineers for practical recommendations.

the **BAIRD MACHINE COMPANY**
STRATFORD • CONNECTICUT

AUTOMATIC MACHINE TOOLS • AUTOMATIC WIRE & RIBBON METAL FORMING MACHINES • AUTOMATIC PRESSES • TUMBLING BARRELS

6 BA51

Build your own SPECIAL MACHINE TOOLS . . . with "Controlled-Air-Power"

Bellows "Controlled-Air-Power" Devices plus standard machine tool components and a little imagination do wonders in meeting today's hurry-up-production demands.

For example. The Hedman Co., Chicago, makers of F & E Check Protectors, had this problem: Drill and tap two ⅛" holes in a piece of brass rod stock. Nothing complicated about it. Any drill press operator could do it. But 125 pieces per hour hand drilling and tapping wasn't enough production. The Hedman Company needed at least 600. The job could have been put on five drill presses. But where do you get the operators? What about cost?

The Hedman Company solved the problem in the same way thousands of manufacturers in all industry are solving similar problems.

They designed and built their own drilling machine. Two standard drill press heads (one to drill, one to tap), two Bellows "Controlled-Air-Power" Feeds to feed the spindles, a Bellows Rotary Feed Table to position the parts. Today's production? 650 pieces per hour average. With one operator.

This story isn't unusual. It's typical of hundreds in our case history files . . . conclusive evidence that the only limit to the usefulness of these versatile, inexpensive Bellows "Controlled-Air-Power" Devices is the ingenuity of tool engineers and production men.

May we send you the case history mentioned above (FF50-537) and a copy of our new bulletin "Faster, Safer, Better Production"? It's worth reading. Address Dept. AM 951.

1254

The Bellows Co.
ESTABLISHED 1911
AKRON 9, OHIO

the company for the foreman to bury a good idea for product improvement or correcting the design just because it is not part of his job to contact the engineering department. It is the easiest thing in the world to just go ahead with the job and ask no questions. The courageous foreman is full of faith in his company. This courageous and loyal foreman will take action involving betterment of the company's product to the extent of going to another department to do so. Discretion may be the better part of valor but an excuse for inaction is worse than a lie; for an excuse is a lie guarded.

Harry Kaufman
Philadelphia, Pa.

•

BARGAIN SHOPPER

WE ALL KNOW that cut-throat competition is of benefit to no one in the long run. The game of grabbing skilled help is to be frowned upon by all fair-minded employers. No one can blame Ed for taking on a man whom he thinks is not employed by someone else—one naturally presupposes that a man is out of a job when he applies for work. Then again, who is there that can point a finger at a man looking out for his own interest, such as a fellow looking for a job before he relinquishes the one he holds? Then again, how would an employee feel if he found out that the boss was searching around for someone to take his place? Weigh the matter on the scales of justice: is it any more of a crime for a man to be looking for a better job than a job looking for a better man?

We cannot say that it is right for a manufacturer to have an understanding with the neighboring firms not to hire an employee who is already working for them. The worker is a free lance and not bound to any employer. He has a right to go wherever he pleases but he has to be tactful in his actions. For his own financial interest it is up to him to play one employer against another, that's free enterprise. For an employer to seek workers from another plant is what we are prone to call pirating labor. This too is free enterprise, but! In the case of the fellow Ed hired it appeared that Ed was sucked in by his own assumption. One thing is certain, and that is that the fellow would certainly find it difficult to gain employment at the old company were he in need of a job at some future date.

A direct question, put to a man seeking a job, asking him if he is at

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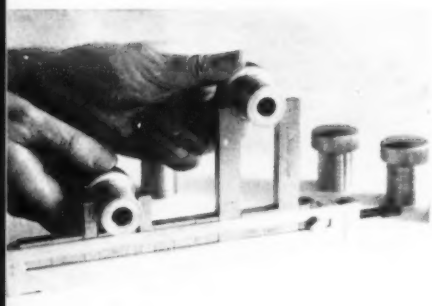

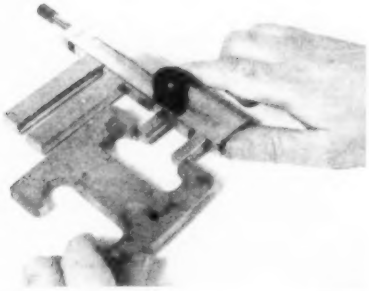

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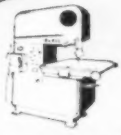

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Note some of the typical parts machined. Ask for illustrated literature giving further details and send samples of your work for a cost estimate on handling it on the Goss & De Leeuw.

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MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

present in the employ of anybody else should be sufficient to avoid any unpleasantness at a later date. If he happens to be employed by another firm there certainly should be some understanding before he is taken on. No fair-minded employer will hesitate in releasing a man if he desires to leave. If I were in Ed's shoes I would feel that if the man would prove disloyal to one employer he wouldn't hesitate in pulling a double-cross again. It resolves itself down to the question as to which is right. From the job-seeker's point of view, wouldn't it be to his interest to be open and above board and say that he happens to be working for someone else and for personal reasons wishes to make a change? Then the new employer could inform the fellow that he could have the job provided he could obtain a "release" from his present employer. This would assure good feelings between the employers involved as well as between the job seeker and his old boss.

John Homewood
Ontario, Calif.

•

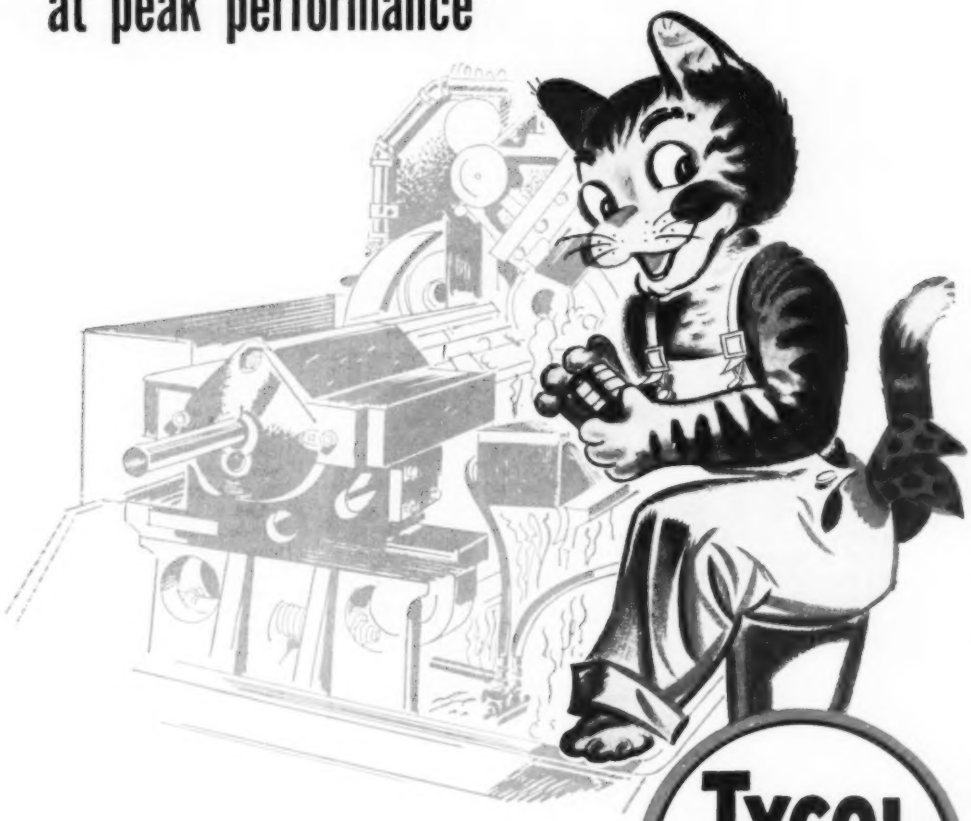
A CERTAIN AMOUNT of "Bargain-Shopping" goes on, year in and year out. We are all prone to it at one time or another. A man would be a fool not to look after himself. His time and skill are his stock in trade and for which in his own interest he must receive the best returns possible.

The medium of exchange is not always money. Working conditions, fringe benefits, the general atmosphere, fellow workers, opportunities for advancement, all play their part. The importance of one or the other is weighed and assessed by the individual worker. Trite or controversially "money isn't everything." That's why employers offer attractive surroundings and other inducements, the money for which could be converted into a few pennies more an hour—but they do more good spent as they are.

Similarily, it is this ability to "Bargain-Shop" that acts as a deterrent to those selfish employees who but for this would leave their plants. Like most things, in moderation, there is no harm and often a lot of good. Equally, from abuse comes the evil. It is a theft, far greater than labor-stealing.

"Job jumpers" or "tourists"—those who in good times when labor is scarce, work two days here, then a few weeks there, always on the move—earn only part of their pay; the rest is filched from the employer just as surely and easily as reaching into the open safe. This last is the

"Tycol Angrove Cutting Oils keep automatics working at peak performance"



Correct – 100% ! Tycol Angrove Cutting Oils withstand high speeds and temperatures . . . yet keep tools working with minimum regrinding. They control build-up on cutting edges. Tool life is lengthened and freer cutting made possible. Furthermore, down time for automatics, turret lathes, and similar machines is reduced.

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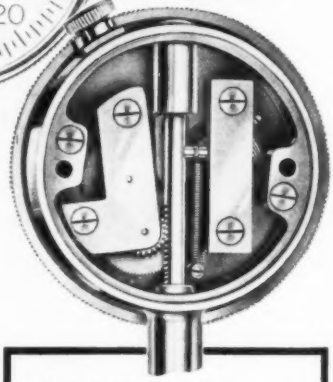

● Ames micrometer dial indicators are the most modern available today —and naturally so because Ames policy for over 50 years has been continually to improve design, to take advantage of new materials and to utilize the most advanced manufacturing methods. They are a real aid to the quality control engineer who is trying to keep pace with today's high production schedules.

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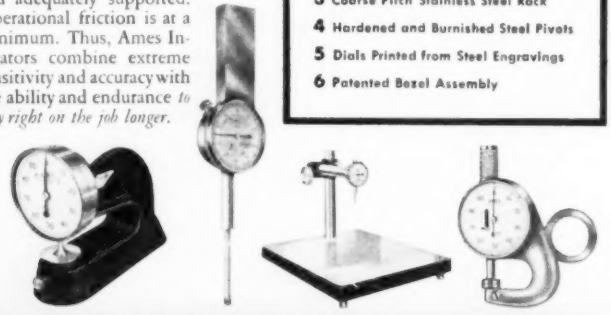

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Mfgr. of Micrometer Dial Gauges • Micrometer Dial Indicators

amount paid them in a piecework shop over and above their produced rate while they are being taught; to bring their earnings up to guaranteed base. If the fellow moves on in a few days or a week, as they often do—he helps himself to some more dough. The unabsorbed overhead represented is the cost of interviewing, hiring, medical exam and multitude of records processed getting him on (and off) the company's books. To this should be added the rate adjustment of the instructor and also an immeasurable charge for additional supervision. All in all, a larceny that multiplied a few times is anything but petty.

It is amazing that management will exercise the most stringent controls over a $100 petty cash fund—personally approving at the highest level each voucher therein charged while ten times that amount walks out the door in any given month, unchallenged. By condoning even unconsciously such a fact, management becomes an accessory of equal guilt. To be both accessory and victim takes some doing. The dual role is any thing but humorous. The lighter touch is provided by the miscreant tourist that walks uncaring through it all.

Labor organized, justifiably, in self-defense. In this matter so must management. Whether within their own confines, those for the community or to farther fields. Make those dates of previous places worked mean something. Check on them. Locally, it's only a phone call, done even on a 2 out of 3 basis or 5 out of 7 the news will soon get around.

It's better to let those three machines a man can operate at what could be a production rate of $20 apiece an hour stand idle for whatever time it takes to check on a

Finally got a new man for you, he knows the tailstock from the headstock—I think

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With screws in limited supply, you have a better chance of improved delivery when you order *standard* types and sizes than when you order specials.

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P-K Assembly Engineers will help you in every way possible to adjust your assemblies to limited supplies, and apply the long experience of Parker-Kalon to your most difficult problems of planning and procurement. Parker-Kalon Corporation, 200 Varick Street, New York 14, N. Y. Sold through Accredited Distributors.

TYPE A— the original Sheet Metal Screw, for light gauge sheet metal. **TYPE Z**— a thread-forming screw for light and heavy gauge sheet metal, non-ferrous castings, plastics, etc. Also made with **HEX HEAD**, suitable in heavier sizes for structural steel. **TYPE F**— cuts standard machine screw thread as it is driven. For ferrous and non-ferrous castings, light and heavy sheet metal, plastics, etc. **TYPE U**— Drive Screw for making permanent fastenings to ferrous and non-ferrous castings, plastics, etc.

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The Original

PARKER-KALON* SELF-TAPPING SCREWS

A TYPE AND SIZE FOR EVERY METAL AND PLASTIC ASSEMBLY

How to Take *Chance* Out of Today's Alloy Buying

Here's a spark tester checking bars of Ryerson alloy steel. By reading the spark pattern thrown off when each bar is touched with this whirling, abrasive wheel, the tester determines the steel's analysis. In this way he verifies quality—guards against mixed steels.

Spark testing is only one of many steps in the Ryerson Certified Steel Plan for safer alloy buying—a plan especially important to you today, while restrictions are enforcing the use of leaner alloys with unfamiliar heat treatment response.

We also put every heat of Ryerson alloy steel through four separate hardenability tests, carefully recording the results on a Ryerson Alloy Certificate which goes with the steel. These tests enable you to buy Ryerson alloys on the basis of hardenability as well as analysis—the safest way to buy under today's changing conditions. And the recorded test results safely guide your heat treatment. So play safe. Order from Ryerson where you can specify hardenability and be doubly sure. Stocks are out of balance from a size standpoint, but in all probability we can take care of your requirements.

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CAREON STEEL BARS —Hot rolled and cold finished
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ALLOYS —Hot rolled, cold finished, heat treated
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man's last place of employment. Better than to hire him simply because, looking sideways at him you can't see daylight through his ears. He won't (unless he's a qualified man and we're talking about obvious or questionably transients) produce anywhere near that and he'll cost you money and morale to boot. If it's unskilled bench, assembly or labor job, what the haste? Sure a man is needed—needed bad. At 100% the first day the best he can produce is around $10 worth of direct labor. Hire him and you're committed to three times that, the minute he signs on. It isn't worth it.

This isn't "labor-stealing" — it might be "bargain-shopping"—but, believe me, it is stealing and it's no bargain!

A. M. Elliott
Lockport, N. Y.

•

GOOD FOR EVIL

ED SEEMS to be planning to settle an old score with a former employee when asked for a recommendation. He doesn't seem to realize in passion one is more likely to use stronger language than when one is in a normal state.

A cooling-off period often works wonders. When time is given for careful consideration and favorable points are considered both pro and con, a chance is given to correct mistakes, overlooked during a heated discussion.

A foreman is as liable to mistakes as anyone else and should be ready to make amends for them whenever there is an opportunity.

Good for Evil is a good motto and when one comes to realize the matter, it brings not only progress but satisfaction as well.

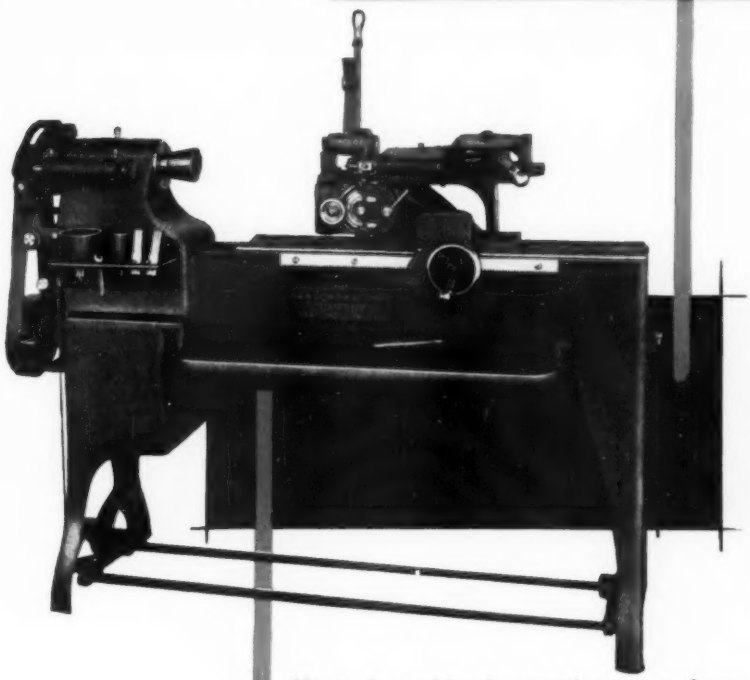
John Mark May
Watervliet, N. Y.

•

A MAN'S TEMPER is only one of his qualifications as a leader of men. Many great leaders were quick-tempered, but their better talents exceeded their shortcomings. Many of today's supervisors blow their tops frequently, but this act does not bring on a demerit. In many cases it is more effective than being cool-headed. Sometimes a blowing off of steam will relieve strained relations quicker than a calm, deliberate discussion.

When a good man states he is leaving, it is a good policy to find out what his reasons are. If he seems irritated or irked, a good informal

Hanson-Whitney Rapid Precision Centering Machine



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Here's the machine that precision centers almost any part with a machined finish — round, square, ball-ended, tapered — up to 3¼" diameter. A variety of parts machined from the bar on automatics or semi-automatics can thus be centered quickly, accurately for subsequent grinding, milling, or special threading operations.

Centers are first drilled and then shaved, on one side only, to insure absolute accuracy, an operating feature that reduces the amount of stock allowed for finishing operations. A simple treadle arrangement leaves operator's hands free for speedy work handling.

This efficiently designed machine costs little, delivers the work fast. A note on your company letterhead brings an 8-page detailed bulletin by return mail.

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All Lovejoy Blades for Type "A" Milling Cutters are interchangeable from 4½" to 24" in diameter
. . . and this applies to every "A" cutter ever made!
Lovejoy Type "A" face milling cutter blades offer unsurpassed economy — 1) they are interchangeable throughout the complete range of housing sizes, 2) H.S.S., carbide and cast alloy blades are interchangeable in every housing, 3) every blade will fit every Type "A", even if you have housings 30 years old, 4) only a minimum of stock must be removed when sharpening, 5) a large percentage of every blade is usable; 6) there is no need to carry a large inventory, as Lovejoy can supply blades promptly from stock. For superior performance, plus maximum economy, use Lovejoy Type "A" for every face milling job.
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TOOL COMPANY, INC.

talk or even the afternoon off will cement better relations. When the man is determined to leave, a session in the office will soon reveal his reasons. Too many supervisors bring a man into their office and talk the employee's ear off without obtaining any information.

If a man has something on his mind, he will soon reveal everything if he is unknowingly forced to carry the conversation, especially if the atmosphere is relaxing. Many times a man leaving the employ of a company will not hesitate to express his opinion of conditions or actions of other employees. This information at times can be valuable if kept in strict confidence. On the other hand a retiring employee may make false accusations, knowing that he will not be asked to produce proof. He might also exaggerate conditions to cover up the minor aggravation which brought about his decision to leave.

The supervisor should investigate every piece of information he may obtain from a leaving employee to determine what steps may be taken to correct other employees' intentions of leaving.

Frank J. Zarnowski
Rutherford, N. J.

•

LOST DIAMOND MYSTERY

THE OPERATION of any equipment which is used today in our production plants must be handled in a manner to protect it from serious damage. The use of a diamond for grinding wheel dressing is in this same strata. The problem is not new. It has faced supervision for many years. It certainly tries the patience of foremen and superintendents and sometimes results in harsh words or fired personnel.

Perhaps the trouble is deeply rooted in human nature. No one likes to admit he does not know how to do a job. No one wants to be shown and too many can bluff realistically enough to get by until the emergency comes along. Then these persons go to pieces and commit the serious offense of damaging costly tools and equipment.

There are, of course, two classes of accidents to equipment. One is the damage to tools and equipment caused by the workers who have grown sloppy in their working habits and are taking chances. The other is an accident caused by the worker who knows no better. True, both cost the company money in valuable equipment and oftentimes lost production. Yet when we start to

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analyze the problem what is the first thing we see? Isn't it the fact that supervision is more or less responsible for the condition? If the foreman had been doing his job or had been trained properly to accomplish this task of management, the careless worker would not have been allowed to continue unless he mended his ways. On the other hand the worker who did not know how to handle the tools would have received proper instruction and supervision.

This is a complex problem, created by our industrial world. It is a problem that all management fails to face because it means work. It means establishing standards of worker level and it means foremen training.

Why do we always want to pass this responsibility by? Partly because much of our management of the past generations have come up through the plant and they are not equipped to handle the problem. No reflection is made on their ability as producers, but many of them are poor managers and poorer leaders and teachers. Management should be chosen for their ability to **manage,** not to produce.

Foremen, it is up to you to be on your toes. Know your men and don't be an office sitter. Don't let paperwork make you a clerk. Be a manager of men and a good manager. Help your men to learn to properly use the equipment and tools. And always keep calm.

Charles D. Townsend
W. Hartford, Conn.

"Send me an asbestos postcard when you get down there, O.K.?"

"improved accuracy approximately 100% over four other methods"

VISUAL INDEXING...

makes this improvement possible according to a letter from the Manager of Machine Tool Equipment for a large business machine manufacturer.

He also says: "ease of operation and speed of setting is very good."

How can OPL visual indexing improve quality and reduce set-up time on your machine tools?

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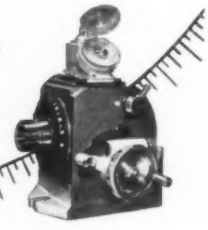

F. T. GRISWOLD MFG. CO.
WAYNE 2, PA., U.S.A.

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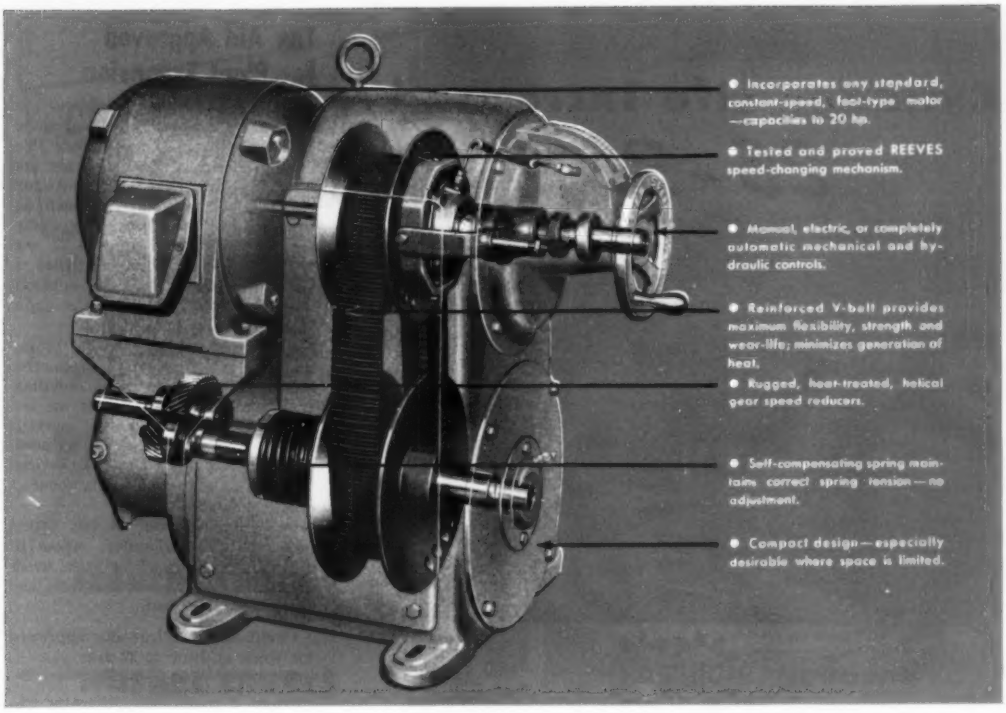
● Incorporates any standard, constant-speed, foot-type motor —capacities to 20 hp.
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● Compact design—especially desirable where space is limited.

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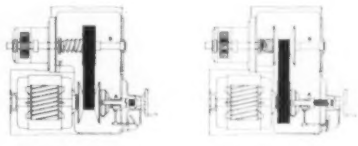

REEVES Vari-Speed Motodrive utilizes proved REEVES operating principle of a V-belt driving between two pairs of cone-shaped discs which are adjustable to form an infinite number of driving and driven diameters. Discs are mounted on parallel shafts. One shaft receives power at constant speed from motor —other delivers power at infinitely adjustable speed to gear reducer from which desired speed is transmitted to driven machine.

Here's a complete variable speed power plant in one, space-saving unit . . . incorporating an operating principle proved in 300,000 installations . . . ruggedly constructed for years of trouble-free service. Without stopping the machine, a turn of the REEVES handwheel or touch of a button provides the correct speed for every operation . . . enables the machine to do *more* work and *better* work at lower cost. Available in vertical and horizontal designs; capacities to 20 hp; and speed ratios as great as 10 to 1. For the machines you are now operating and the new ones you plan to buy, obtain all the benefits of stepless speed adjustability by specifying modern REEVES Vari-Speed Motodrive. Send for free catalog No. A-67-G.

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Recognized leader in the specialized field of variable speed control

accurate • variable

REEVES *Speed Control*

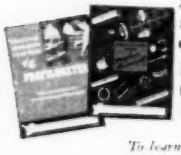
Cylinder Life Increased

25-30%

because OILGEAR uses the **PROFILOMETER**

In the production of hydraulic pump cylinders at the Oilgear Company, Milwaukee, Wisconsin, the Profilometer is used in two ways. First, it is used when all pilot models of cylinders are being constructed to help determine the optimum surface finish required for maximum life and efficiency of the part. Then, as a production tool, the Profilometer insures that each part will conform to the specifications that are set up. Oilgear engineers estimate that use of the Profilometer in this manner, as compared to previous methods of surface inspection, *has increased the life of the cylinders 25-30%.*

In its use as a shop tool at Oilgear, the Profilometer has a continuous function in the production of the cylinders. It checks both the finish grind and the final lapping operation which must produce a rating of 50 microinches or less. In addition, pistons for all cylinders are held to about a 6 microinch finish, and these, too, are checked in production with the Profilometer



Fast, accurate surface measurement is important to Oilgear's operations. The Profilometer gives it to them.

To learn how the Profilometer can help cut costs in your production, write today for these free bulletins.

Profilometer is a registered trade name.

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Tax Aid Approved For Plant Expansion

WASHINGTON — Certificates of necessity for accelerated tax amortization, approved by Defense Production Administration in June and July, are listed here. Up to August 3, rapid tax write-off has been authorized for 3007 new or expanded facilities. The total amount of certificates on all these facilities is $8,648,382,487, of which approximately 70% is allowed for rapid amortization.

The program's purpose is to expand private industry's productive capacity quickly to meet mobilization goals. Certification of an important defense facility permits individuals, companies or corporations to amortize an authorized amount of a new facility over a five-year period.

Information given in the listing below is in this order: name of company, location of facilities, product or service, amount eligible, and percentage certified.

Certificates of Necessity approved for week of June 15-22 are:

McDonnell Aircraft Corp., Robertson, Mo., airplanes, $111,425—75%.

Kearney & Trecker Corp., West Allis, Wis., milling machines, $1,229,140—75%.

Ryan Aeronautical Co., San Diego, Calif., ordnance, $84,163—75%.

Watson Mfg. Co., Inc., Jamestown, N. Y., ordnance, $46,541—85%.

Wean Equipment Corp., Cleveland, wire mill machinery, $366,439—80%.

Vickers, Inc., (Vickers Elec. Div.), St. Joseph, Mo., electric generators, $22,302—75%.

Borg-Warner Corp. (Spring Div.), Bellwood, Ill., metallic belt, ordnance, $482,803—75%.

Bay State Abrasive Products Co., Westboro, Mass., grinding wheels, abrasive products, $1,119,279—75%.

The Budd Co., Philadelphia, ordnance, $41,647—85%.

Chicago Cutting Die Co., Chicago, carburetor parts, $12,034—75%.

Southworth Machine Co., Portland, Me., airplane parts, $43,122—90%.

Ajax Electrothermic Corp., Trenton, N. J., electric induction furnaces, $165,000—75%.

Aetna-Standard Engr. Co., Ellwood City, Pa., ordnance, $3,153,712—75%.

Douglas Aircraft Co., Inc., Santa Monica, Calif., airplanes, $61,367—75%.

Allegheny Ludlum Steel Corp., Ferndale, Mich., carmet tipped tools, $385,000—75%.

Macklin Co., Jackson, Mich., grinding wheels, $450,000—80%.

Chrysler Corp., Detroit, welding sub-assemblies, $36,372—75%.

Racine Tool & Machine Co., Racine, Wis., hydraulic pumps, $240,959—80%.

Simonds Abrasive Co., Philadelphia, bonded abrasive products, $718,620—80%.

Pennsylvania Saw Corp., Newark, N. J., saws, $83,882—80%.

Texas Bolt & Supply Co., Houston, Tex., nuts, $223,815—75%.

Russell, Burdsall & Ward Bolt & Nut Co., Portchester, N. Y., ferrous and non-ferrous nuts, $246,683—75%.

Seaboard Coil Spring Corp., Los Angeles, Calif., springs, wire forms, $71,085—75%.

K S. Merchantville, N. J., arc-welding studs, $165,422—80%.

Morris Bean & Co., Yellow Springs, Ohio, aircraft, $669,138—75%.

Ware Laboratories, Inc., Miami, Fla., optical assemblies, $63,899—80%.

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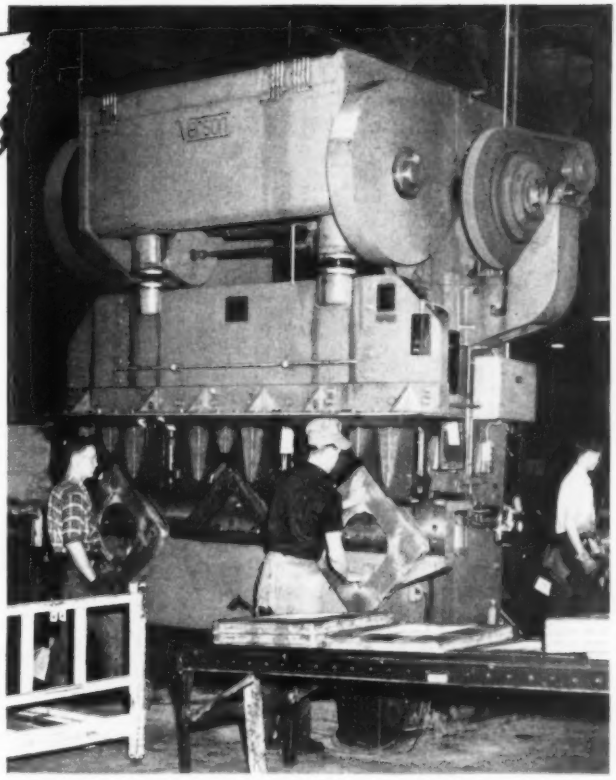
THIS TRADE Verson MARK PRESS BRAKE TOOL-UP

return flanges 200 washer covers per hour



In modern metal forming procedures, the press brake has become a "Jack-of-all-trades" and a very good one at that. Take the job illustrated above—tops of Maytag automatic washers are return flanged on a Verson Major Press Brake with Verson Tooling—and on a production basis. Yet, as well as the press brake performs on the more complicated jobs, it is equally adaptable to simple bending with runs of just a few pieces.

If you have a forming, bending, coping, notching or punching job, it will pay to consider a Verson Press Brake Tool-Up. There is a Verson Press Brake for every need from 48" of 16 ga. steel up to long lengths of heavy plate. Both mechanical or hydraulic types are available. Verson Press Brake Tooling can be furnished for virtually every shape from a simple 90° angle to the most intricate multi-operation formed sections.

Descriptive literature giving design details and specifications is available. Write for your copy outlining the nature of your problem. Practical, experienced Verson engineering assistance is also available to help you in the selection of the right equipment for your job.

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Evans Tool & Die Co., Detroit, machining & boring, $56,759—80%.
Baldwin-Lima-Hamilton Corp. (Lima-Hamilton Div.), Hamilton, Ohio, gray iron castings, $335,200—75%.
Douglas Aircraft Co., Inc., Santa Monica, Calif., airplanes, $755,730—75%.
Tool Steel Gear & Pinion Co., Cincinnati, screws, axles, rolls, gears, $1,420,195—80%.
Watson-Stillman Co., Roselle, N. J., forged steel fittings, $418,000—75%.
Timken Roller Bearing Co., Canton, Ohio, steel tubing, $1,450,000—60%.
General Brass & Machine Works Inc., Hillside, N. J., aircraft, $52,628—75%.
Sylvania Elec. Products Co., Inc., Boston, electronic tubes, $47,688—80%.
Ex-Cell-O Corp., Fostoria, Ohio, aircraft, $1,684,642—75%.
Airquipment Co., Burbank, Calif., aircraft equipment, $68,583—80%.
Goodyear Tire & Rubber Co., Akron, Ohio, aircraft, $56,080—75%.
Crawford Door Co., Detroit, aircraft, $256,-019—75%.
Ohio Knife Co., Cincinnati, tool steel ways, $887,018—80%.
Fuller Mfg. Co., Milwaukee, steel forgings, $50,821—75%.
Blaw-Knox Co., Pittsburgh, cast steel, $1,146,000—75%.
Wm. R. Whittaker Co., Ltd., Los Angeles, check valves, $41,213—85%.
Standard Steel Spring Co., Gary, Ind., springs for vehicles, $60,860—75%.
Agawam Aircraft Products, Inc., Sag Harbor, N. Y., hydraulic assemblies, $60,590—75%.
Clary Multiplier Corp., Los Angeles, aircraft, $35,512—75%.
Hotpoint, Inc., Chicago, aircraft, $2,251,700—75%.
Raytheon Mfg. Co., Waltham, Mass., transformers, $14,079—85%.
Wadell Equipment Co., Garwood, N. J., boring head bodies, $33,275—85%.
Gorham Mfg. Co., Providence, R. I., electronic mixer assemblies, $63,419—85%.
Kell-Strom Tool Co., Inc., Wethersfield, Conn., service tools, $28,411—90%.
Pattern Products Mfg. Co., Detroit, Mich., aircraft, $47,589—80%.
Swallow Airplane Co., Inc., Wichita, Kan., aircraft, $18,603—85%.
Crocket Mfg. Co. Culver City, Calif., airframe parts, $43,195—90%.
Kingston Products Corp., Kokomo, Ind., connection end (forging-steel), $47,928—90%.
Earl DeLay & Co., Columbia, S. C., sheet metal products, $29,500—60%.
American Steel Foundries, Verona, Pa., steel castings, $381,000—75%.
Parker Appliance Co., Los Angeles, Calif., check valves, $419,508—80%.
Gear Grinding Machine Co., Detroit, Mich., universal joints, $279,854—90%.
B. F. Goodrich Co., Los Angeles, aircraft, $345,106—75%.
Talley Machine & Mfg. Corp., Los Angeles, aircraft parts, $5,607—90%.
General Motors Corp., Rochester, N. Y., electric slip clutch, $38,419—75%.
Archer Machine Products Co., Los Angeles, aircraft, $70,636—90%.
Aircraft Products Co., Clifton Heights, Pa., aircraft, $28,655—90%.

Gideon-Anderson Lumber Co., Gideon, Mo., ordnance, $10,602—50%.
Wm. R. Whittaker Co., Ltd., Van Nuys, Calif., aircraft-fuel & hyd. valves, $2,427,250—80%.
E. & J. Heat Treating & Sandblasting Co., Los Angeles, Cal., heat treating of metal, $60,000—75%.
Thomco Mfg. Co., Inc., Redwood City, Calif., parts for tape recorder, $5,954—90%.
Northrop Aircraft Inc., Hawthorne, Calif., airplane parts $76,071—75%.
Boeing Airplane Co., Seattle, Wash., aircraft spare parts, $795,985—75%.

Certificates of Necessity announced for week of June 22-29:

Miller Motor Co., Melrose Park, Ill., hydraulic cylinders, $599,752—80%.
Aluminum Industries, Inc., Cincinnati, ordnance, $310,317—85%.
McDonnell Aircraft Corp., Robertson, Mo., airplanes, $94,631—75%.

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"PAID OFF" in 48 days

JOB: Grinding welds on truck cabs. Using slow, 20-pound electric grinders. Only 2800 r.p.m. under load.

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RESULTS: Stepped up metal removal, increased wheel life. Lower maintenance. Cut man-hours per cab. Savings "paid off" cost of Rotor Grinders in 48 days—on basis of 50% use factor.

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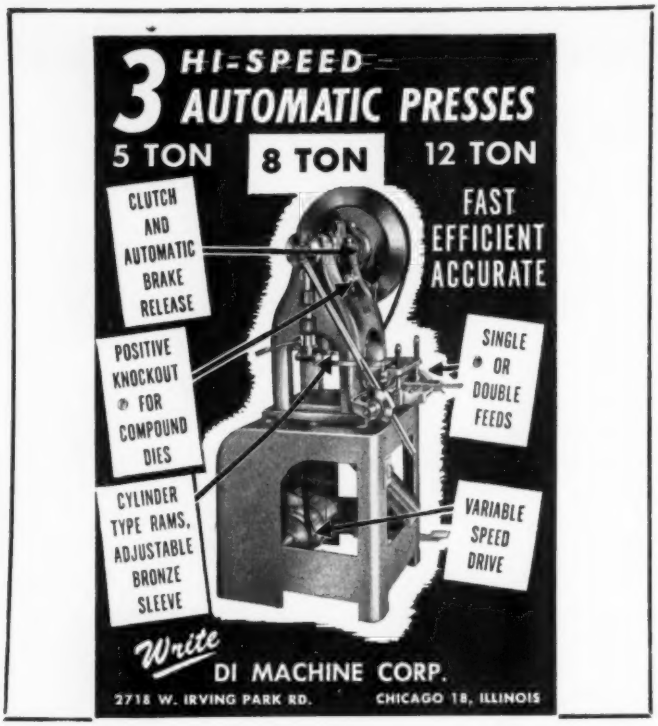
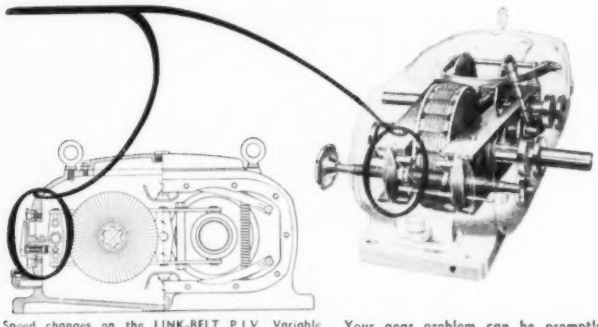


Mass. G&T Gear

Applied in P.I.V. Variable Speed Drive



Speed changes on the LINK-BELT P.I.V. Variable Speed Drive are shown by means of a rack and pinion, furnished by "Mass. Gear," which connects directly to speed setting indicator. Close speed selection, resetting and readings are assured by the accuracy of these gears.

Your gear problem can be promptly and effectively handled by consulting Massachusetts Gear & Tool Co., Woburn, Mass. Write for free illustrated literature.

Massachusetts Gear & Tool Co.

Superior Valve & Fittings Co., Pittsburgh, Pa., cylinder valves, $11,389—90%.

American Saw & Mfg. Co., East Longmeadow, Mass., metal cutting saws, $665,700—80%.

Ace Tool & Die Co., Detroit, Mich., milling machines, $333,600—80%.

New York Air Brake Co., Watertown, N. Y., hydraulic pumps, $60,600—60%; locomotive brakes, $456,702—60%.

Owensboro Forging Co., Owensboro, Ky., forgings, $371,000—80%.

Schwien Engineering Co., Los Angeles, Calif., aircraft, $350,000—75%.

Molded Insulation Co., Philadelphia, cable connectors and radiosonde equipment, $370,000—75%.

Douglas Aircraft Co., Inc., El Segundo, Calif., airplanes, $453,221—75%.

Guardian Electric Mfg. Co., Woodstock, Ill., electrical equipment, $213,850—75%.

Hydraulic Press Mfg. Co., Mount Gilead, Ohio, hydraulic presses, $187,437—85%.

Maine Specialty Co., South Portland, Me., turnbuckles, bolts, $33,763—75%.

Kopelove Iron & Metal Co., Dayton, Ohio, overhead crane, $45,672—75%.

Pipe Machinery Co., Wickliffe, Ohio, gages, $210,000—75%.

Webster Electric Co., Racine, Wis., ordnance, $750,000—75%.

Fosdick Machine Tool Co., Cincinnati, metal drilling machinery, $112,000—80%.

Groov-Pin Corp., Ridgefield, N. J., pins, studs, inserts, (metal), $464,000—80%.

Superior Gear Co., Inc., Birmingham, Ala., gears, pinions, $50,526—90%.

Babcock & Wilcox Co., Alliance, Oh'o, steamboilers, $115,577—60%.

Bendix Aviation Corp., Sidney, N. Y., aircraft magnetos, $463,375—85%.

Sonnet Supply Co., Hawthorne, Calif., cutting tools, $61,289—80%.

Timken Roller Bearing Co., Zoerville, Ohio, $52,732—85%.

National Supply Co., Terrance, Calif., ordnance, $48,677—90%.

Curtiss-Wright Corp., Caldwell, N. J., flight trainers, simulators, radio aid units, $70,137—85%; aircraft, $1,126,818—80%.

Quaker City Gear Works Philadelphia, precision gears, $236,696—80%.

Metalee, Inc., Jackson, Mich., tube fittings, $19,475—60%.

Fafnir Bearing Co., New Britain, Conn., ball bearings, $7,999,405—85%.

Hartford Machine Screw Co., Windsor, Conn., nitriding of steel parts, $9,747—60%.

Lindberg Steel Treating Co., Inc., Chicago, heat treating of metals, $32,375—60%.

Ganary Brothers, Mt. Ephraim, N. J., ordnance, $14,181—90%.

Lake Erie Engr. Corp., Township of Tonawanda, N. Y., heavy hydraulic presses, $29,360—75%.

Helipot Corp., South Pasadena, Calif., potentiometers, $53,623—85%.

Hotpoint, Inc., Cicero, Ill., aircraft, $4,020,125—75%.

International Harvester Co., Melrose Park, Ill., ordnance, $2,131,499—75%.

Webber Gage Co., Cleveland, gage blocks, $22,945—75%.

Certificates of Necessity announced for week of June 29-July 6:

Pantex Mfg. Corp., Central Falls, R. I., aircraft, $29,407—90%.

Ex-Cell-O Corp., Highland Park, Mich., machine tools, $214,158—80%; aircraft engine parts, $857,175—80%.

American Steel Foundries, East Chicago, Ind., steel castings, $58,100—75%.

Aircraft Products Co., Delaware County, Pa., aircraft parts, $83,985—75%.

Kennametal, Inc., Latrobe, Pa., metalworking tools $56,686—75%.

Reeves-Hoffman Corp., Carlisle, Pa., oscillators, $50,765—75%.

Loral Electronics Corp., Bronx, N. Y., ordnance, $31,959—75%.

Michigan Steel Casting Co., Detroit, Mich., aircraft, $15,510—75%.

Universal Moulded Products Corp., Bristol, Va., ordnance materiel, $7,439—75%.

S & S Corrugated Paper Machinery Co., Inc., Brooklyn, N. Y., ordnance, $56,830—90%.

Continued on p. 246

subcontracting NEWS

Can You Cut High-Precision Gears? Air Force Seeks Subcontract Sources

DAYTON, Ohio—Have you the facilities to make precision gears to rigid specifications? Can you manufacture parts requiring difficult machining operations which the average shop cannot perform? If so, contact procurement officials at Air Materiel Command headquarters. They are initiating a plan of distributing technical descriptions of high-precision parts to assist aircraft manufacturers in locating special subcontract sources.

The plan will not only help the larger manufacturers to find subcontractors, but will also offer small business concerns another opportunity to get in on the defense dollar.

In brief, here is how the system will work:

Manufacturers currently engaged in military contract work make known their critical requirements in high precision parts to the Aircraft Production Resources Agency (APRA). In turn, APRA releases detailed descriptions of each item for publication in industry journals and public news media. In addition, 32 Air Procurement District and Regional Offices will post this information in the same manner as "Invitations for Bids" are advertised.

Each manufacturer in need of the critical parts and components appoints a monitor whom potential subcontractors may contact directly.

Procurement officials caution that only manufacturers who are able to meet the specifications of high-precision parts should offer their services to the prime contractors. The data given in the announcements is sufficiently detailed to permit any manufacturer to determine if he is capable of turning out the product in question.

APRA officials add that this means of publicizing the need for manufacturers of critical items will not always be restricted to high-precision parts. In the future contractors may be looking for manufacturers to make components which are process-wise more simple.

The first company to ask for APRA's assistance under this plan is the Bell Aircraft Company, now looking for manufacturers to make precision gears for helicopter transmissions. The specifications describing three types of gears follows. Bell representatives request that manufacturers who are able to meet these specifications, contact Mr. M. J. Coughlin, Bell Aircraft Company, Niagara Falls, N. Y.

BELL AIRCRAFT—Part No. 47-620-221.
GEAR: upper sun transmission: steel bar 4620 Government Spec 10240 GR III (Army); 46 teeth; diametral pitch 10; circular pitch 0.3142; pitch dia 4.600; pressure angle 20°; base circle dia 4.3226; OD 4.800 + 000 — .002; bore 3.920 thickness of tooth, shaved gear after hardening or ground gear, 0.1501 to 0.1521; index error must not exceed 0.0002 between adjacent teeth; parallelism error with axis must not exceed 0.0005 per in. of length; backlash with mating master gear (representing mating part but to 0.1621 gage chordal thickness) at 3.450 gage center distance 0.000 to 0.002; reference only—backlash with production mating gear at 3.450 gage center distance 0.005 to 0.008; carburize at 1700° F to produce 0.025 to 0.035 finished case depth; surface roughness must not exceed 80 microinches. NOTE—Teeth can be hobbed.

BELL AIRCRAFT—Part No. 47-620-424
PINION—Transmission Upper Planet—Steel Bar ANS 6294; 23 teeth; diametral pitch 10; circular pitch 0.3142"; pitch dia 2.3000 in. base circle dia 2.1615; pressure angle 20°; index error must not exceed 0.0002 between adjacent teeth; thickness of the tooth 0.1560 to 0.1570 in.; parallelism error with axis must not exceed 0.0005 per in. of length; backlash with mating master gear representing mating part (but to 0.1570 gage chordal tooth thickness) at 3.4500 gage center distance 0.000 to 0.001; reference only backlash with production mating gear at 3.4500 gage center distance 0.005 to 0.008; selectively carburized to provide finish case depth of 0.025 to 0.035 and 0.045 to 0.060; when mounted on diameter, pitch dia of gear as indicated over 0.1728 wire must not run out more than 0.0010 total indicator reading; magnetic inspection per Spec AN-1-32; NOTE—Teeth can be hobbed.
BELL AIRCRAFT—Part No. 47-620-425

GEAR—Pinion—Transmission Lower Stage—steel bar stock AMS 6294; 19 teeth; diametral pitch 10; circular pitch 0.3142 in., pitch dia 1.9000 in.; pressure angle 20°; base circle dia 1.7854 in., index error must not exceed 0.0002 between adjacent teeth; parallelism error with axis must not exceed 0.0005 per inch of length; backlash with mating master gear representing mating part (but to 0.1570 gage chordal tooth thickness) at 2.8500 gage center distance 0.000 to 0.001; reference only—backlash with production mating gear part at 2.8500 center distance 0.005 to 0.008; selectively carburized to provide finish depth of 0.025 to 0.035 and 0.045 to 0.060; when mounted on diameter, pitch diameter of gear as indicated over 0.1728 in. wire must not run out more than 0.0010 total indicator reading; magnetic inspection per Spec. AN-1-32. NOTE—Teeth can be hobbed.

Carrier Gets Tank Subcontract

SYRACUSE, N. Y.—A contract for quantity production of 15-ton armored steel hulls for the Army's new M-47 medium tank has been awarded to Carrier Corp., to be produced at Carrier's heavy machinery plant on Thompson Road.

The tank order is one of several major defense contracts undertaken by Carrier, totalling in aggregate more than $50 million, including its recently announced contract for production of essential parts for General Electric's J-47 turbojet engine.

The tank hulls will be produced under subcontract to American Locomotive Co., Schenectady. Tooling is now in progress, involving some $5 million worth of welding equipment, boring mills, and other special machine tools, to be purchased for government account.

Martin Subcontracts 10 Times More Work Than in 1950

BALTIMORE—Over 3000 subcontractors, suppliers, and vendors from coast to coast will share this year in $88-million worth of business to be placed by the Glenn L. Martin Co. This is an increase of 112% over last year, based on gains of the company's backlog, which now amounts to approximately $400 million.

Dollar volume of subcontracting purchases will amount to about $52 million this year, with two-thirds of the purchases being made from small businesses. This is over ten times as much business as was subcontracted by the company in 1950.

Subcontractor Exhibit Dates

WASHINGTON — Exhibits to enable small businessmen to examine military items which they might make under subcontracts are being further scheduled by the Armed Forces Regional Councils. Latest dates available: Atlanta, Sept. 10-12; and Detroit, Oct. 29-Nov. 1.

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WHEEL 28" DIAMETER
SHAFT 5 FEET LONG
VALUED AT THIS POINT, AT NEARLY $4,000

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2. Broaching gives you production output greater than that of any other machining method.
3. Broaching is the surest way to save important metals.

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Navy List of Items in Short Supply Offers Subcontract Opportunities

WASHINGTON — Certain components in short supply which are required by prime contractors to complete work now in process are being listed by Navy procurement offices in an effort to expedite production.

Manufacturers with available production facilities may write or visit the listed contractor to obtain some of this essential military work. Information about the listings, which follow here, may be obtained also from the nearest office of the Material Inspection Service, USN.

Subcontractor opportunities with Navy contractors are listed here with the prime contractor named first, followed by the subcontract item in short supply. In some instances, specifications are given:

• Fabricated Metal Items

Hardie Tynes Mfg. Co., Birmingham, Ala.—gray iron piston rings, high test; bronze pump impellers.

Blair Aluminum Furniture Co., Marietta, Ga.—steel fabricated chair components.

Dixie Bronze Co., Birmingham—silver solder rings.

Ruffe, Inc., Miami, Fla.—Rotary type wire stripper; Boston gears; reamers; high-speed precision taps; counterbore drills; countersinks.

Western Electric Co., Winston Salem, N. C.—shield; tube shield; gear; MKO spline shaft; spline shaft drive unit; bellows; Ds kit 202 console cabinet issue 4; flange, coupling; bracket; retainer, disk hoist tilt mechanism.

General Communications, Boston—counters—Vedor-Root type.

Granite State Engr., Manchester, N. H.—nameplates.

Northeastern Engr. Co., Inc., Manchester, N. H.—springs.

Whiton Machine Co., New London, Conn.—flange 5½ OD 1⅝ thick; specifications: no drilling, no bore. 600-lb steam pressure, 850 F max. temp.

Manning, Maxwell & Moore, Inc., Bridgeport, Conn.—valve springs; specifications: for 1-in. type 1503 relief valve set at 25 lb.

Gabb Mfg. Co., Windsor Locks, Conn.—knurled knobs & adapters.

Oriel Duro, Milwaukee—steel drums.

Allis-Chalmers Mfg. Co., West Allis, Wis.—stainless steel spring.

Oshkosh Motor Truck Co., Oshkosh, Wis.—steel hood & panel assemblies; running board assemblies; truck exhaust pipe; truck carburetors.

Archer-Daniels-Midland, Minneapolis—5-gal. metal containers.

Arkay Supply Co., Rochester, Minn.—guide rollers, screw machine products.

American Hoist & Derrick Co., St. Paul, Minn.—log chains.

Benjamin Moore Co., Denver, Colo.—steel containers.

Gibson Mfg. Co., Longmont, Colo.—gasoline engines; valves.

Fairbanks, Morse & Co., Beloit, Wis.—piston pins; piston pin sleeve.

General Instruments, Inc., Dallas, Tex.—transformer laminations; specifications: .006-in. thick Carpenter 49 steel hydrogen-annealed after stamping.

Duro-Chrome Corp., St. Louis, Mo.—steel springs.

Brunson Instrument Co., Kansas City, Mo.—compass needles.

Private Brands Inc., Kansas City, Mo.—metal cans.

Nebel Machine Co., Cincinnati—collets, various sizes.

D. C. Morrison Co., Covington, Ky.—chucks.

Plan-O-Mill Corp., Hazel Park, Mich.—hydraulic pumps, rams, & controls, for machine tools, hydraulic equipment.

Kunkle Valve Co., Ft. Wayne, Ind.—springs.

Bennett-Feragan Co., South Bend, Ind.—gears.

Stewart & Stevenson Services, Inc., Houston, Tex.—diesel engines; radiators, for electrical generator sets.

Tips Engine Works, Austin, Tex.—truck wheels & rims, for crane trucks.

Porcel Corp., Little Rock, Ark.—shipping containers, 14.6 gal. 20 gage steel drums.

Worthington Pump & Machinery Corp., Buffalo, N. Y.—cylinders, for Worthington air compressors; liners, for Worthington air compressors.

R. M. Hollingshead Co., Camden, N. J.—5-gal. containers, herasite lined.

General Electric Co., Schenectady, N. Y.—precision bearings, for gyros.

Ford Instrument Co., Long Island City, N. Y.—springs; snap rings; gears.

Small Firms Doing Most of Service Shipbuilding

WASHINGTON — Small business firms received 47 of the 53 contracts awarded for construction of Army and Air Force vessels during the past fiscal year. The contracts totalled over $50 million.

The Navy Bureau of Ships, which acts as the procurement agency for service vessels, reports dollar volume of small business contracts amounts to about 60% of total shipbuilding funds.

The contracts cover construction of 586 vessels including barges, harbor tugs, control boats, lighters, and rescue boats.

LATEST DEFENSE CONTRACTS

ARMY ORDNANCE AWARDS

Tank Automotive Center, Detroit

Trailmobile Co., Cincinnati — spare parts, semi-trailers, $152,900.

Bethlehem Steel Co., Bethlehem, Pa.—hardware, $129,200.

Valley Forge & Car Co., Stillwater, Minn.—tools, $148,400.

Manley Div., York, Pa.—tools, $111,264.

Union Wire Rope Corp., Kansas City, Mo.—hardware, $224,800.

Detroit Aluminum & Brass Corp., Detroit—parts, combat vehicle and tank, exceeds $250,000.

Sunbury Wire Rope Sales Co., Inc., New York—hardware, exceeds $250,000.

M-D Parts Mfg. Co., Los Angeles, Calif.—parts, motor vehicle, $109,282.

Detroit Ordnance District

American Blower Corp., Detroit—spare parts, tank-automotive.

Telegraph Machine & Tool Co., Pontiac, Mich.—differential assembly.

U. S. Motor Truck Sales, Detroit—spare parts, tank-automotive.

Frankfort Arsenal, Philadelphia

General Electric Co., Philadelphia—assembly and unit feeder, exceeds $250,000.

Rochester Ordnance District, N. Y.

Graflex, Inc., Rochester, N. Y.—boresights, $141,582. Spare parts, fire control, $68,980.

Easy Washing Machine Corp., Syracuse, N. Y.—fuzes, exceeds $250,000.

Van Der Horst Corp., Olean, N. Y.—chrome plating, $219,350.

K. R. Wilson, Buffalo, N.Y.—combination tools, exceeds $250,000.

Eastman Kodak Co., Rochester, N.Y.—periscopes and spare parts, exceeds $250,000.

Ward-LaFrance Truck Corp., Elmira, N.Y.—hoods, fenders and tail pipes, etc., $132,142. Truck parts, $108,823.

New York Ordnance District

Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J.—tank & automotive supplies.

Vulcan Rail Construction Co., Maspeth, N. Y.—spare parts.

ARMY ENGINEERS AWARDS

Philadelphia District Engineer

General Electric Co., Philadelphia — spare parts, $110,824.

Buda Co., Harvey, Ill.—generator sets, exceeds $250,000, 2 contracts; portable generators, spare parts, etc., $203,595, $124,100.

O'Brien Dieselectric Corp., Philadelphia—generators, exceeds $250,000.

Bolinders Co., Inc., New York—generators, exceeds $250,000.

Hill Diesel Engine Corp., Lansing, Mich.—generators, exceeds $250,000.

Master Vibrator Co., Dayton—generators, exceeds $250,000.

Beam Radionics Corp., Chicago — lighting equipment, exceeds $250,000.

Lonergan Mfg. Co., Albion, Mich. — space heaters, $183,214.

Murphy Diesel Co., Milwaukee—spare parts, $134,851.

John Reiner & Co., Long Island City, N. Y.—generators, exceeds $250,000, pumps, exceeds $250,000.

Hale Fire Pump Co., Conshohocken, Pa.—trailer pumper, fire $245,804.

John R. Hollingworth, Clifton Hts., Pa.—generators, exceeds $250,000.

Howe Fire Apparatus Co., Anderson, Ind.—truck bodies, fire, exceeds $250,000.

U. S. Pipe & Mfg. Co., San Francisco, Calif.—manifold assemblies, $151,755.

George C. Lewis Co., Philadelphia—flake iceplant, exceeds $250,000.

Harrisburg Steel Corp., Harrisburg, Pa.—oxygen cylinders, exceeds $250,000.

(Continued on page 239)

the SKILL *the* FACILITIES

. . . *to Provide a Truly COMPLETE Die Shop Service*

Supplementing Allied's extensive die shop facilities is a modern, completely-equipped foundry for precision-cast zinc alloy dies. Here, thoroughly skilled and experienced personnel produce dies for experimental parts and short run production . . . quickly, accurately and economically.

The operation of this foundry is typical of Allied's policy to provide in all of its plants and in every department a *full* measure of service to its customers.

Other

ALLIED PRODUCTS

HARDENED AND PRECISION GROUND PARTS • SPECIAL COLD FORGED PARTS • STANDARD CAP SCREWS • SHEET METAL DIES FROM THE LARGEST TO THE SMALLEST • JIGS • FIXTURES R-B INTERCHANGEABLE PUNCHES AND DIES

PRECISION • EXPERIENCE • DEPENDABILITY

ALLIED CORPORATION PRODUCTS

ALLIED PRODUCTS CORPORATION

DEPT. D-2 • 12605 BURT ROAD • DETROIT 23, MICH.

PLANT 1
Detroit, Mich.

PLANT 2
Detroit, Mich.

PLANT 3
Hillsdale, Mich.

PLANT 4
Hillsdale, Mich.

DEFENSE AWARDS . . . continued

Cummins Engine Co., Columbus, Ind.—power plant, diesel, $171,255.

Coast Manufacturers, Concord, Calif.—fire trucks, $244,218.

General Detroit Corp., Detroit—fire trucks, exceeds $250,000.

Minnesota Fire Equipment Corp., N. Branch, Minn.—fire trucks, $218,070.

Central Fire Truck Corp., St. Louis, Mo.—fire trucks, $225,558.

W. S. Darley & Co. Chicago—fire trucks, $148,159.

Joy Mfg. Co., St. Louis, Mo.—lighting kits, exceeds $250,000, 2 contracts.

Pittsburgh Lectrodryer Corp., Pittsburgh—dehumidifying unit, $132,577.

Emerson Electric Mfg. Co., St. Louis, Mo.—circulating fan, $110,977.

Larkin Lectro Prod. Corp., Pine Bluff, Ark.—transformers, $120,615.

Hobart Bros., Troy, Ohio—generators, $128,-020, portable generators, $105,937.

Air Products, Inc., Emmaus, Pa.—generators, exceeds $250,000.

S. T. Johnson Co., Oakland, Calif.—heaters, $146,940.

Dakota Fire Apparatus Co., Sioux Falls, S. Dak.—fire trucks, $248,000.

General Fire Truck Co., Detroit—fire trucks, exceeds $250,000.

Dewey-Sheppard Boiler Co., Indianapolis—heaters, $128,000.

Roller-Smith Corp., Bethlehem, Pa.—switching equipment, $109,310.

SIGNAL CORPS AWARDS

Philadelphia Procurement Agency

W. C. Fleck & Bros., Inc., Jenkintown, Pa.—tool equipment.

Weston Electrical Instrument Co., Philadelphia—multimeter.

General Electric Co., Philadelphia—test sets.

Sola Electric Co., Chicago—transformers.

Century Tool Co., Philadelphia—tool equipment.

Hickok Electrical Instrument Co., Cleveland—test sets.

Connecticut Telephone & Radio Corp., Meriden, Conn.—telephone sets.

Johnson Service Corp., Milwaukee—radiosonde.

Motoresearch Co., Racine, Wis.—generators.

Federal Telephone & Radio Corp., Clifton, N. J.—radio sets, radio terminal sets.

Video Products Corp., Red Bank, N. J.—radio sets.

Parkchester Machine Corp., New York—generators.

Western Electric Co., New York—transmitters, telephone terminal sets.

Alliance Mfg. Co., Alliance, Ohio—interphone equipment, power units.

Benmar Mfg. Co., Inc., Elizabeth, N. J.—field strength meters.

Radio Corp. of America, Camden, N. J.—radar sets, spare parts.

National Cash Register Co., Dayton—teletypewriter set.

Collins Radio Co., Cedar Rapids, Iowa—radio receivers.

Raytheon Mfg. Co., Waltham, Mass.—radio sets, radar sets.

Kollsman Instrument Corp., Elmhurst, L. I., N. Y.—humidity measuring kit.

Penn Boiler & Burner Mfg. Corp., Lancaster, Pa.—power units.

Rabin Industries, Inc., Chicago—generators.

Jacobsen Mfg. Co., Racine, Wisc.—power units.

John R. Hollingsworth Corp., Clifton Heights, Pa.—power units.

Maspeth Telephone & Radio Corp., Brooklyn, N. Y.—reperforator sets.

Teletype Corp., Chicago—reperforator transmitter.

Westinghouse Electric Co., Philadelphia—coils and transformers.

American Measuring Instrument Corp., New York—cavities, radiosonde.

Cinch Mfg. Corp., Chicago—sockets.

O'Keefe & Merritt Company, Los Angeles, Calif.—generator set.

United States Motors Corp., Oshkosh, Wisc.—power unit.

Kohler Co., Kohler, Wisconsin—power unit.

Vickers Inc., Detroit—spare parts, armament.

Grumman Aircraft Engineering Corp., Bethpage, L. I., N. Y.—armament spares.

Crescent Insulated Wire & Cable Co., Inc., Trenton, N. J.—arc welding, portable.

Seth Thomas Clock Div., General Time Corp., Thomaston, Conn.—wall clocks.

Rochester Products Div., GMC, Rochester, N. Y.—springs & cam, regulators.

Federal Mfg. & Eng. Corp., Brooklyn, N. Y.—signal generator.

Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J.—booster control.

Goodyear Aircraft Corp., Akron, Ohio—spare parts.

Northeastern Engineering, Inc., Manchester, N. H.—spectrum analyzer.

Telephonics Corp., Huntington, L. I., N. Y. telephones.

Cameraflex Corp., New York—photometric camera.

Universal Motor Co., Oshkosh, Wisc.—power units.

Highway Trailer Co., Edgerton, Wisc.—earth borer.

A. R. F. Products, Inc., River Forest, Ill.—generators.

General Radio Co., Cambridge, Mass.—frequency calibrator.

Kurtz & Root Co., Appleton, Wisc.—generators.

Utility Electronic Corp., Newark, N. J.—multimeters.

Motorola, Inc., Chicago—radio sets.

S. H. Couch Co., Inc., N. Quincy, Mass.—switchboard, emergency.

Utility Electronics Corp., E. Newark, N. J.—radio set.

Espey Mfg. Co., New York—radio terminal set.

A. C. Gilbert, New Haven, Conn.—power supply.

Sentinel Radio Corp., Evanston, Ill.—radio set.

Emerson Radio & Phonograph Co., New York—radio set.

Kaiser Metal to Build Wings on Martin Subcontract

WASHINGTON—This month, Kaiser Metal Products, Inc., got back into the aviation business with a contract to engineer, tool, and manufacture wings for Glenn L. Martin Co. Size of the contract was kept under wraps but Kaiser disclosed that it will add about 7000 more employees at its Bristol, Pa. Plant plus undertaking a $1-million remodeling job of its facilities there.

The subcontract is for the manufacture of wings for the Martin-built USAF night intruder bomber, the Canberra. Martin is under license from the English Electric Co., Ltd. to build the plane here. The Canberra currently holds the record for the non-stop Atlantic crossing—4 hrs 40 min.

Standard Coil Products Co., Inc., Los Angeles, Calif.—radiosonde.

Rudolph Wurlitzer Co., N. Tonawanda, N. Y.—converter.

Radio Corp. of America, Camden, N. J.—coils and transformers.

Connecticut Telephone & Electric Corp., Meriden, Conn.—telephones, central office set, and switchboards.

Alliance Mfg. Co., Alliance, Ohio—auxiliary interphone equipment.

Kellogg Switchboard & Supply Co., Chicago—telephone switchboard.

Hallicrafters Co., Chicago—radio terminal set, radio set.

Wind Turbine Co., W. Chester, Pa.—erection kit.

Consolidated Diesel Electric Corp., Stamford, Conn.—parts, power units.

Triplett Electrical Instrument Co., Bluffton, Ohio—tube tester.

A. C. Transformer Corp., Newark, N. J.—transformers.

Teletype Corp., Chicago—teletypewriters.

Stromberg-Carlson Co., Rochester, N. Y.—switchboards.

A. R. F. Products, River Forest, Ill.—maintenance parts, radio.

Scott-Atwater Mfg. Co., Chicago—drive assemblies.

P. R. Mallory & Co., Inc., Indianapolis, Ind.—telephones.

Hendey Machine Co., New York—lathes and accessories.

Atlas Metal Stamping Co., Philadelphia—receiver and transmitter.

Packard-Bell Co., Los Angeles, Calif.—frequency amplifier.

Hoffman Radio Corp., Los Angeles, Calif.—frequency shift converter.

Automatic Electric Sales Corp., Chicago—teletypewriter, switching center.

Sparks-Withington Co., Jackson, Mich.—frequency meter.

Kleinschmidt Laboratories, Inc., Deerfield, Ill.—teletypewriter switching center components, teletypewriters.

QUARTERMASTER AWARDS

Chicago Purchasing Division

J. B. Martino & Co., Gardena, Calif.—coffee urns, $192,649.

Aluminum Cooking Utensil Co., New Kensington, Pa.—aluminum pots, exceeds $250,000.

International Silver Co., Meriden, Conn.—table knives, stainless steel, exceeds $250,000.

Peters-Dalton Inc., Detroit—dish-washing machine exceeds $250,000, 2 contracts.

F. H. Lawson Co., Cincinnati—galvanized cans, $106,081.

Comet Industries, Franklin Park, Ill.—dishpans, $103,339.

Silent Glow Oil Burner Corp., Hartford, Conn.—tent heater, gasoline, $114,400.

Hunt Heater Corp., Dayton, Tenn.—stove, tent, $247,000.

Russell Harrington Cutlery Co., Southbridge, Mass.—knives, $120,969.

Hussman Refrigerator Co., St. Louis, Mo.—refrigerator, refrigerating units, refrigerated warehouse, prefabricated, exceeds $250,000, 2 contracts.

Triumph Mfg. Co., Cincinnati—kitchen equipment exceeds $250,000.

ABC Steel Equip. Co., New York—office furniture, exceeds $250,000.

Miller Trainers, Inc., Bradenton, Fla.—semi-trailers, exceeds $250,000.

International Silver Co., Meriden, Conn.—forks, table spoons, exceeds $250,000.

Gifford-Wood Co., Hudson, N. Y.—vegetable peeling machine, $137,162.

S. Blickman, Inc., Weehawken, N. J.—steam table, exceeds $250,000.

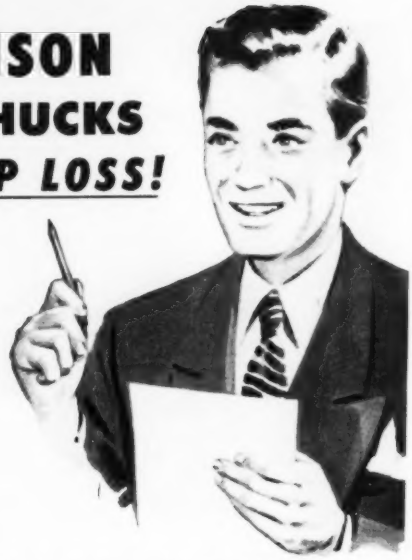
U. S. Slicing Machine Co., LaPorte, Ind.—meat-slicing machine, $110,517. Meat slicing machine, exceeds $250,000, 2 contracts.

Vulcan Hart Mfg. Co., Louisville, La.—griddles, $100,514.

Gresham & Co., Inc., Kansas City, Mo.—dishwashing machine, $212,580.

(Continued on next page)

GARRISON GEAR CHUCKS *CUT SCRAP LOSS!*



Here's WHY

Built-in accuracy and exclusive, patented fixed multiple location, "average-out" errors of cutting and heat treating.

EVERY GARRISON GEAR CHUCK ALSO FEATURES:

QUICK CHUCKING . . . Garrison gear chucks have increased production as much as 700%.

QUICK SET-UPS . . . Garrison gear chucks are ready for use as soon as they are mounted to a simple face plate or adapter.

SHORT OVERHANG . . . Assures closer limits and better finish.

VERSATILITY . . . Garrison gear chucks are used for any operation after the teeth are cut.

Garrison pitch line control gear chucks are "custom-built" for each gear by specialists who have manufactured gear chucks exclusively for over thirty years. This accumulated gear chuck knowledge pays off for you at final inspection.

To cut scrap loss, eliminate upset schedules and assure consistent, uniform high production day after day . . .

. . . SEND YOUR GEAR PRINTS FOR A QUOTATION!

Garrison

MACHINE WORKS, INC.

DAYTON 4, OHIO

Boeing Delivers First Fast Multi-Purpose Stratofreighter

SEATTLE—Boeing Airplane Co. has delivered the first of a series of modified Stratofreighters to the Strategic Air Command, USAF. Designated KC-97E, the multi-purpose plane is the first production model designed to operate either as a tanker aircraft, troop transport, cargo carrier, or hospital airplane.

The Flying Boom system incorporated into this model utilizes a telescoping metal pipe to transfer gasoline under pressure from tanker to receiver airplane. This enables refueling to be accomplished in the air at greater fuel flow rates, higher altitudes, and faster aircraft speeds.

Thermo Cuber Co. Inc., Chicago—dishwashing machine, $147,502.
Aluminum Goods Mfg. Co., Manitowoc, Wis.—baking and roasting pans, exceeds $250,000.
Renown Stove Co., Owosso, Mich.—centrifugal pumps, gasoline, exceeds $250,000.
Carrolton Mfg. Co., Carrolton, Ohio—dishpans, exceeds $250,000.
Progressive Welder Sales Co., Detroit—industrial equipment, $132,449.
Federal Refrigeration Mfg. Co., Waukesha, Wis.—refrigeration prefabricated, storage box, $82,000.

NAVY AWARDS

Navy Purchasing Office, Washington 25, D. C.

Chicago Pneumatic Tool Co., Philadelphia—rotary grinders, impact wrenches.
Greenfield Tap & Die Corp., Greenfield, Mass.—threading sets, taps, etc.
West Bend Equipment Corp., West Bend, Wisc.—trucks.
Rockford Machine Tool Co., Rockford, Ill.—hydraulic planers.
Crescent Truck Co., Lebanon, Pa.—tractors.
Independent Pneumatic Tool Co., Aurora, Ill.—pneumatic drills.
Archway Equipment Co., Philadelphia—inert arc welding machines, $107,766.
Heli-Coil Corp., Long Island City, N. Y.—insert extractors, $136,680.
Harry J. Ferguson Co., Jenkintown, Pa.—conveyers, gravity, exceeds $250,000.
Elmes Eng. Div., American Steel Foundries, Cincinati—forging press, $131,561.
Stevens Walden, Inc., Worcester, Mass.—wrench sets, $126,430.
Electric Wheel Co., Quincy, Ill.—warehouse trailors, $206,686.
Lester-Phoenix, Inc., Cleveland — injection molding machines, $110,776.
Hendey Machine Co., Torrington, Conn.—tool room lathes, $119,410.
Cherry Rivet Co., Div. of Townsend Co., Los Angeles, Calif.—rivet pull gun, $124,359.
Hanson-Van Winkle-Munning Co., Matawan, N. J.—electroplating machine, $122,054.
Snap-On-Tools Corp., Kenosha, Wisc.—wrenches, crowfoot, exceeds $250,000.

Ships Part Control Center, Mechanicsburg, Pa.

Cleaver-Brooks Co., Milwaukee, Wisc.—repair parts, steam boilers, $111,984.
Commercial Engineering Co., Washington—repair parts, oil clarifier, exceeds $250,000.

Bureau of Ships, Washington 25, D. C.

National Steel Construction Co., Seattle, Wash.—float, non-magnetic, exceeds $250,000.
Pacific Boatbuilding Co., Tacoma, Wash.—minesweepers, exceeds $250,000.
Martinolich Shipbuilding Co., San Diego, Calif.—minesweepers, exceeds $250,000.
RCA Victor Div., Radio Corp. of America, Camden, N. J.—radio receivers, exceeds $250,000.

New York Purchasing Office

Henry & Wright Div., Enhardt Mfg. Co., Hartford, Conn.—impact shock testing machine, $129,700.

Bureau of Ordnance, Washington 25, D. C.

Aerial Products, Inc. Elkton, Md.—distress signals, exceeds $250,000.
Western Electric Co., New York—spare parts, fire control radar equipment, $250,000.

Naval Construction Battalion Center Port Hueneme, Calif.

J. D. Adams Mfg. Co., Indianapolis—road grader, $221,710, towed grader, $225,632.
Hussman Refrigerator Co., St. Louis, Mo.—refrigerators, $240,919.
Amano Refrigeration, Inc., Amano, Iowa—refrigerators, exceeds $250,000.
Koehring Co., Port Hueneme, Calif.—crane and attachments, exceeds $250,000.
Worthington Pump & Machinery Corp., Los Angeles, Calif.—repair parts, $142,193.
Pettibone Mulliken Corp., Chicago—dragline bucket, $155,350.
Western Iron & Foundry Co., Wichita, Kans.—truck hammer, pile driver, and skull cracker caps, $216,398.

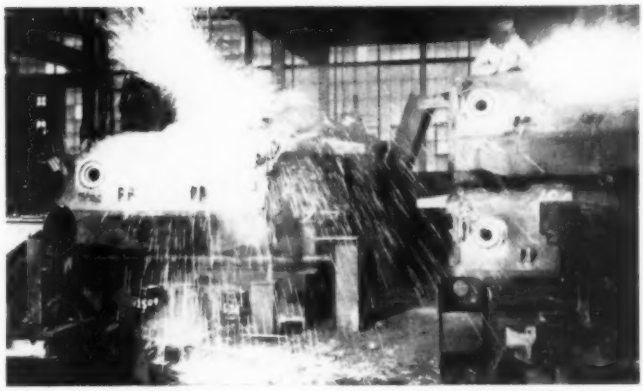
Los Angeles Purchasing Office

Golden State Co. Ltd., Automotive Works, Inc., Los Angeles, Calif.—instrument mounts, spare parts, $215,624.

Small Shops in N. Y. Area Want Defense Subcontracts

NEW YORK—Efforts on the part of the Commerce & Industry Association of New York to push defense work into local plants here are paying off, but there are still approximately 50% of the small shops in the metropolitan area that want defense work and have not been able to obtain it.

Slightly more than 1000 plants in this area have listed their facilities with the association, following a series of questionnaires sent out asking potential subcontractors to file information about their productive capacities, so that the information could be forwarded to contractors seeking subcontractors.



Welders at the Detroit Arsenal burn out hulls on the General Patton medium tank. The treatment removes superfluous rust and steel from the outer shell of the tank. This improved model carries a five man crew and under combat load weighs 48½ tons

Electronics Supply Office Great Lakes, Ill.

National Electrical Machine Shops, Inc., Silver Springs, Md.—attenuator, fixed, $155,095.
Teletype Corp., Chicago—teletype parts, exceeds $250,000.

NAVAL AVIATION AWARDS Aviation Supply Office, Philadelphia

Dial Light Co. of America, Inc., New York—indicator assembly.
Airesearch Mfg. Co., Garrett Corp., Los Angeles, Calif.—maintenance parts.
Chandler Evans Div., Niles-Bement-Pond Co., W. Hartford, Conn.—maintenance parts.
Contes Electric Mfg. Co., Seattle, Wash.—heaters.
Goodyear Aircraft Corp., Akron, Ohio—maintenance parts.
R. E. Darling, Bethesda, Md.—disconnect assemblies.

Naval Air Material Center, Philadelphia 12, Pa.

Rudel Machinery Co., Inc., New York—jig boring and milling machines, exceeds $250,000.

Bureau of Aeronautics, Washington 25, D. C.

Highland Trailer Co., Edgerton, Wisc.—fuel and de-fueling units, exceeds $250,000.
General Electric Co., Washington—indicators, wheel and flap position.

AIR FORCE AWARDS

Air Materiel Command Wright Patterson A. F. Base, Dayton

Alliance Mfg. Co., Alliance, Ohio—adapter assemblies.
General Electric Co., Schenectady, N. Y.—voltage regulators, transformers, rectifiers, and turbojet engines.
Cornelius Co., Minneapolis, Minn.—compressors.
Stewart-Warner Corp., Indianapolis, Ind.—heat exchangers.
Van Norman Co., Springfield, Mass.—milling machines.
General Electric Co., Dayton—rectifiers.
Rapid Electric Co., New York—rectifiers.
Do-All Cincinnati Co., Cincinnati—contour sawing and filing machines.
American Air Filter Co., Inc., Moline, Ill.—engine-driven blowers, gasoline.
Air Products, Inc., Allentown, Pa.—oxygen generator plants.
Beech Aircraft Corp., Wichita, Kan.—generator sets.
Air Research Mfg. Co., Div. Garrett Corp., Los Angeles, Calif.—ground heaters, portable.
Continental Electric Co., Newark, N. J.—generator sets.
cameras.
Fairchild Engine & Airplane Co., Fairchild Engine Div., Farmingdale, Long Island, N. Y.—power plants and spare parts, auxiliary power plants.
Transducer Corp., Boston, Mass.—radar training set.
Stamford Electronics Co., Stamford, Conn.—pulse, generator, exceeds $250,000.
Standard Steel Works, Kansas City, Mo.—trailers, refueling; spare parts, exceeds $250,000.
Heil Co., Milwaukee—refueling trailers, exceeds $250,000.
C. H. Gossinger Machinery Co., Dayton—shapers, $161,402.
Motch & Merryweather Machinery Co., Cleveland—metal shapers, exceeds $250,000.
Badger Northland, Inc., Kaukauna, Wisc.—spare parts, exceeds $250,000.
Hallicrafters Co., Chicago—radio set.
James L. Entwistle Co., Pawtucket, R. I.—automatic coil winding equipment.
Henry Products Co., Brooklyn, N. Y.—mast base.
Homelite Corp., Port Chester, N. Y.—motor generator.
Western Electric Co., Inc., New York—capacitors, transformers, coils.
Sipp-Eastwood Corp., Paterson, N. J.—crystal finishing machines.
General Electric Co., Syracuse, N. Y.—maintenance parts.
Phoenix Electronics, Inc., Lawrence, Mass.—antenna assembly.
Sonic Industries, Inc., New York—dual channel amplifier.
Universal Electronic Labs., Inc., New York—test set.

(Continued on next page)

"RUDOLPH SAYS HE KNOWS THE TAPS WOULD LAST LONGER IF HE HAD THE RIGHT CUTTING FLUID ON THE MACHINE!"

USE OF the *right* cutting fluid for the job *makes taps last longer,* conserves critical tool steel, minimizes down-time, increases output. A typical example:

A large instrument manufacturer changed to Stuart's THREDKUT for tapping Allegheny metal.

	Before Using ThredKut	After Using ThredKut
Tap Life	2 hours	8 hours
Production	180 holes per hour	400 holes per hour

You just cannot ignore the fact that the cutting fluid used is a major factor in any machining operation. A Stuart Representative is prepared to show you how Stuart combines theory and practice to give you better operating performance. Ask to have him call.

Are you receiving Stuart's Shop Notebook regularly? Write, wire or phone.

STUART SERVICE
Goes with every Barrel

CONSERVE TOOLS
Use the Right Cutting Fluid

D.A. Stuart Oil CO.
2729 S. Troy St., Chicago 23, Illinois

AIR FORCE . . . continued

Continental Motors Corp., Muskegon, Mich.—engines, and spare parts, exceeds $250,000, 5 contracts.

Denison Engineering Co., Columbus, Ohio—test stands, $178,245.

Mast Development Co., Davenport, Iowa—photographic interpreters, $163,349.

Eaton Mfg. Co., Cleveland — J-47 turbine blades, $110,000.

General Electric Co., Schenectady, N. Y.—B-36 fire control system, $200,000, $86,003, 2 contracts.

Schuttig & Co., Inc., Washington—radio receivers, exceeds $250,000.

National Die Casting, Chicago—accelerometer, $100,000.

Van Norman Co., Springfield, Mass.—milling machines, exceeds $250,000.

Solar Aircraft Co., San Diego, Calif.—J-47 sub assembly, exceeds $250,000.

Ryan Aeronautical Co., San Diego, Calif.—machinery and equipment, exceeds $250,000.

Servel, Inc., Evansville, Ind.—industrial facilities, exceeds $250,000.

Packard Motor Car Co., Detroit—J-47 engines and components, exceeds $250,000.

Lavoie Lab., Inc., Morganville, N. J.—radio sets, exceeds $250,000.

Link Aviation, Inc., Binghamton, N. Y.—flexible gunnery trainers, exceeds $250,000.

Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.—automatic pilots, exceeds $250,000.

Remler Co., Ltd., San Francisco, Calif.—radio receivers, exceeds $250,000.

Wright-Aeronautical Corp., Woodridge, N. J.—spare parts, engines, exceeds $250,000.

Willys-Overland Motors, Inc., Anderson, Ind.—J-47 engine components, exceeds $250,000.

Republic Aviation Corp., Farmingdale, L. I., N. Y.—machinery and equipment, exceeds $250,000.

American Welding & Mfg. Co., Warren, Ohio—machinery and equipment, exceeds $250,000.

Gilfillan Bros., Inc., Los Angeles, Calif.—radar sets, exceeds $250,000.

Sikorsky Aircraft Div., United Aircraft Corp., Bridgeport, Conn.—helicopter, $245,510.

Motch & Merryweather Machinery Co., Cincinnati—vertical turret lathes, exceeds $250,000.

Standard Steel Works, Kansas City, Mo.—fuel servicing trailors, $139,253.

Tokheim Oil Tank & Pump Co., Fort Wayne, Ind.—pump assemblies, $104,514.

Air Speed Tool Co., Los Angeles, Calif.—pneumatic drills, $246,480.

Cincinnati Milling & Grinding Machines, Inc., Cincinnati—millers, grinders, and sharpening machines, exceeds $250,000.

Master Electric Co., Dayton — generators, spare parts, exceeds $250,000.

American LaFrance Foamite Corp., Elmira, N. Y.—crash fire truck, spare parts, exceeds $250,000.

Erie Foundry Co., Erie, Pa.—drop hammers, exceeds $250,000.

Wolverine Diesel Power Co., Detroit—portable electric plants, spare parts, exceeds $250,000.

Lockheed Aircraft Service, Inc., Long Island, N. Y.—maintenance C-121 aircraft, exceeds $250,000.

National Pneumatic Co., Holtzer-Cabot Div., Boston, Mass.—inverters and spare parts, exceeds $250,000.

U. S. Gauge Div., American Machine & Metals Inc., Sellersville, Pa.—transmitters, exceeds $250,000 (2 contracts), oil pressure indicators, exceeds $250,000 (2 contracts).

Robbins & Myers Inc., Springfield, Ohio—hoist-electric cable, $121,100.

Pratt & Whitney Div., Niles-Bement-Pond Co., W. Hartford, Conn.—boring machines, exceeds $250,000.

E. A. Kinney Co., Cincinnati—verticle spindle jig borer, $106,010.

Refinite Sales Co. Div., Refinite Corp., Omaha, Neb.—demineralizers and spare parts, exceeds $250,000.

Lamar Aero Supply Corp., Clinton, Okla.—driftmeter overhaul, $124,800.

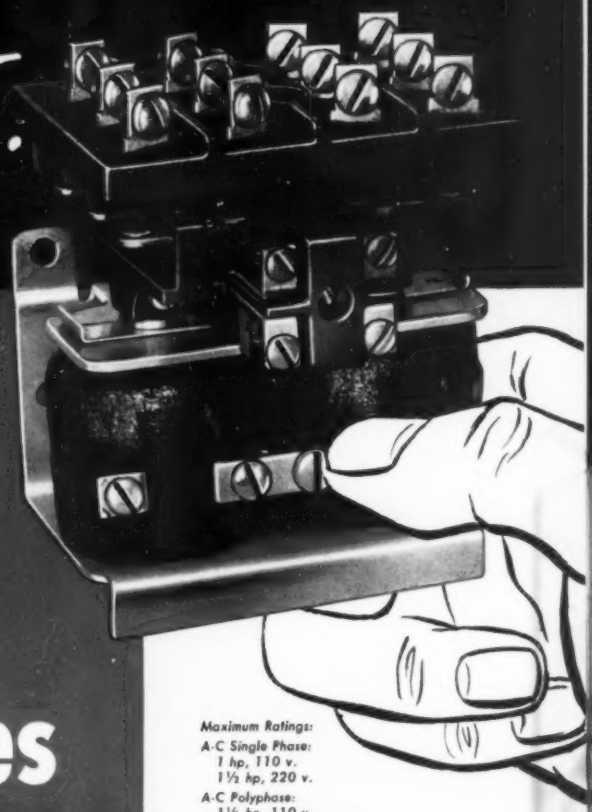
Bendix Products Div., Bendix Aviation Corp., South Bend, Ind.—wheel assembly, brake assembly, and spare parts, $170,007.

North American Aviation, Inc., Los Angeles, Calif.—F-86E aircraft changes, exceeds $250,000.

McColpin-Christie Corp., Los Angeles, Calif.—rectifiers, $175,247.

Pittsburgh-Des Moines Steel Co., Pittsburgh—air heaters, exceeds $250,000.

New...



BULLETIN 705

STYLE A—A-C OR D-C

Reversing Switches

Here is a new, low cost, automatic reversing switch . . . extremely small in size . . . for small hoists, light monorail cranes, overhead doors, and other similar services.

Bulletin 705 Size A Reversing Switch in Type 1 Enclosure.

Bulletin 705 reversing switches consist of two mechanically interlocked solenoid contactors. Style A is for 2 wire control; Style B has auxiliary contacts for 3 wire control.

These small reversing switches have the same trouble free solenoid action and maintenance free contacts on which the reputation of other Allen-Bradley controls has been established.

Allen-Bradley Co.
1316 S. Second St., Milwaukee 4, Wis.

ALLEN-BRADLEY
QUALITY
MOTOR CONTROL

A-B Quality

Maximum Ratings:

A-C Single Phase:
1 hp, 110 v.
1½ hp, 220 v.

A-C Polyphase:
1½ hp, 110 v.
2 hp, 220-440-550 v.

D-C: ¾ hp, 115-230 v.

- **SMALL SIZE**
- **LOW COST**
- **SIMPLE SOLENOID MECHANISM**
- **DOUBLE BREAK SILVER ALLOY CONTACTS**
- **MECHANICAL INTERLOCK**
- **AUXILIARY CONTACTS FOR 3 WIRE CONTROL**

6-51-R

Announcing . . .

Bulletin 350
STYLE A
Compact
Low Cost

A-B Quality

Reversing Drum Switch

For a-c and d-c motors rated 2 hp or less

The new Bulletin 350 manually operated reversing drum switch provides a reliable unit for applications where space is at a premium and low cost is an all important factor. It is equivalent to a three pole, double throw switch equipped with quick make action. Contacts are cadmium silver alloy, eliminating the need for maintenance.

Bulletin 350 reversing switches are ideal for small workshop tools and for medium duty industrial service. They can be used with d-c motors, or single phase, two phase, or three phase a-c motors, rated two horsepower or less. Send for Bulletin 350.

Allen-Bradley Co.
1316 S. Second St., Milwaukee 4, Wis.

ALLEN-BRADLEY
QUALITY
MOTOR CONTROL

MOUNTING ARRANGEMENTS

With mounting angle and double conduit opening.

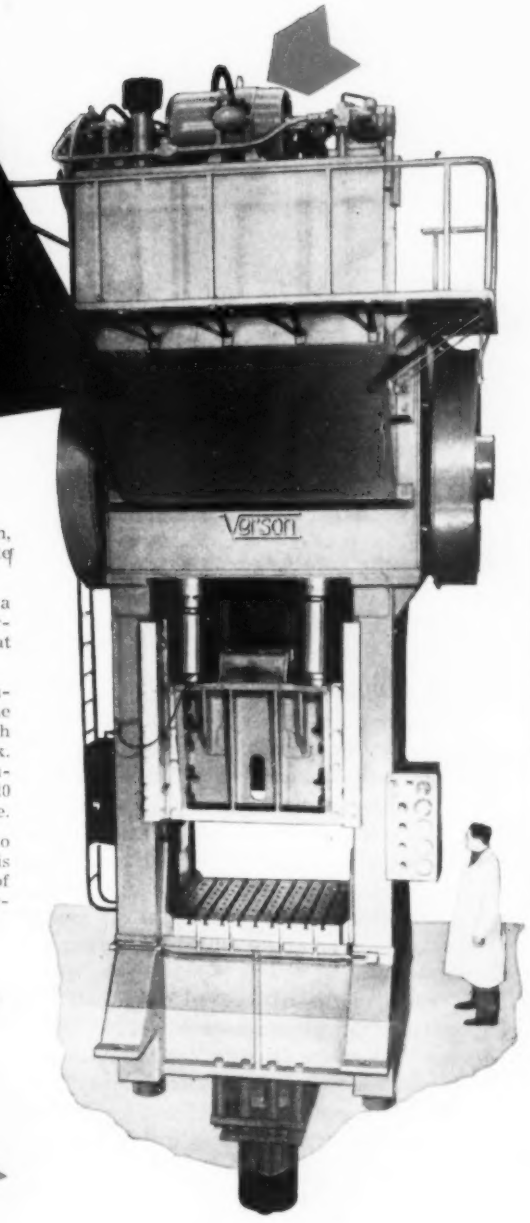
Drum switch mounted on standard square junction box.

With cover plate for cavity mounting in machine base.

Switch mounted on standard octagonal junction box.

6-51-R

Machine with a POWERHOUSE PUNCH!



In one mighty blow, this giant 850-ton, double-action, deep-drawing Verson Allsteel press forms an intricate automobile part.

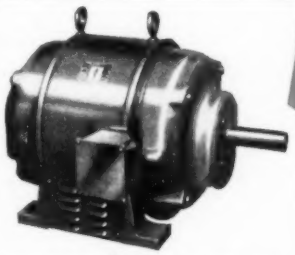
Multiply this by seven strokes a minute, 3 shifts a day, seven days a week and you have a rugged operating schedule . . . one which the Howell motors that power this fine press take right in stride.

Howell engineers worked closely with this manufacturer to select the *right* motor for each job. The main drive motor is a Howell 50 H.P. high slip, high torque motor designed specially for punch press work. The self-adjusting blankholder is driven by a hydraulic pump, powered by a 50 H.P. Howell motor. A 20 H.P. Howell motor operates another hydraulic drive.

Howell will devote the same care and attention to your electric motor problems and needs. With this cooperation and Howell quality, you're assured of motors that will stand up under the heaviest production load over long periods without interruption.

May we help you?

HOWELL ELECTRIC MOTORS COMPANY
Howell, Michigan



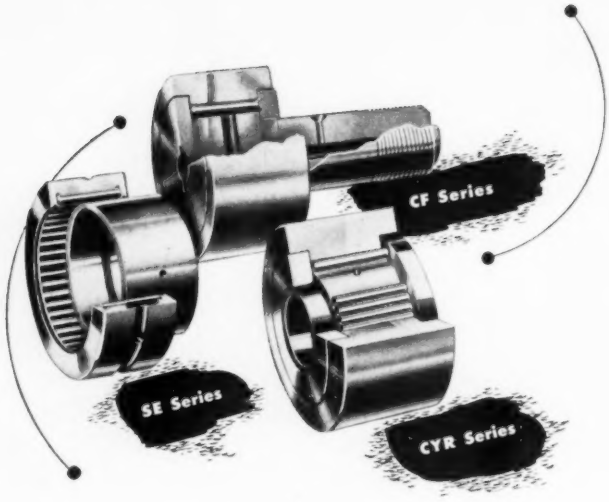
Howell Type F Motor. A high slip, high torque motor designed for punching and shearing operations. Sizes ½ to 200 H.P. in open frames; ½ to 125 H.P. in enclosed frames.

HOWELL Red Band MOTORS

HOWELL MOTORS

HOWELL ELECTRIC MOTORS CO., HOWELL, MICH.

Precision-built industrial motors since 1915



MULTIROL *precision*
is ***PERMANENT***

The fine precision originally built into every McGill Multirol Bearing actually lasts longer. It can easily be considered permanent by comparison because Multirol Bearings are free from early internal wear that can destroy the accuracy of friction type bearings.

The rolling action of small diameter rollers maintaining a constantly lubricated roller line contact with raceways makes the difference — keeps the Multirol Bearing equipped machinery operating at top efficiency without costly maintenance for frequent adjustments and bearing replacement.

For the increased production demands just ahead you will need the performance extras of McGill Multirol Bearings. Adopt the SE Series for precision handling of increased loads when radial space is limited. Either the CF Series with stud or the CYR Series for shaft mounting will withstand heavy shock load in any kind of cam action application.

Write today for descriptive Multirol® Bearing Bulletins.

McGILL® precision bearings

McGILL MANUFACTURING CO., INC., BEARING DIVISION
111 N. LAFAYETTE ST., VALPARAISO, INDIANA, U. S. A.

Patterson Foundry & Machine Co., East Liverpool, Ohio, foundry equipment, $30,000—90%.

Pratt & Letchworth Co., Inc., Buffalo, N. Y., armor castings, $70,000—75%; castings for tank, $210,500—75%.

National Broach & Machine Co., Detroit, machine tools, $589,710—80%.

General Radio Co., Cambridge, Mass., electronic test equipment, $725,000—75%.

Contour Saws, Inc., Des Plaines, Ill., saw blade, $325,635—80%.

R. A. Hawks Co., Sierra Madre, Calif., parts of gas turbines, $15,157—90%.

Standard-Thompson Corp., Dayton aircraft, $31,791—75%.

Stewart-Warner Corp., Chicago, transmitter, $15,663—75%.

American Steel Foundries, Cincinnati, boring mills, $91,000—90%.

Affiliated Screw Products Co., Chicago, fine screws, $25,311—85%.

All Power Mfg. Co., Montebello, Calif., aircraft, $19,472—90%.

Parker Appliance, Cleveland, tube fittings, $319,198—85%.

Charles L. Jarvis Co., Middletown, Conn., rotary files, $5,687—75%.

Tecni-Taps, Inc., N. Attleboro, Mass., taps and rotary files, $219,853—80%.

Fairbanks, Morse & Co., Kansas City, Kan., diesel engines, pumps, $7,749,770—70%.

Wean Mfg. Co., Warren, Ohio, welding machinery, $173,200—75%.

McKiernan-Terry Corp., Dover, N. J., sonar dome, housings, parts, $620,915—85%.

Buckeye Aluminum Co., Wooster, Ohio, ordnance, $82,122—75%.

Streine Tool & Mfg. Co., New Bremen, Ohio, machine tools, $245,000—80%.

Aluminum Co. of America (Davenport Works), Davenport, Iowa, tapered metal sheet and plate, $56,000—60%.

Union Carbide & Carbon Corp., Rifle, Colo., tungsten metal powder, $55,000—60%.

New York Air Brake Co., Watertown, N. Y., locomotive brakes, $35,564—60%.

Hitchiner Mfg. Co., between Milford and Wilton, N. H., ferrous and nonferrous castings, $112,516—85%.

Carlton Machine Tool Co., Cincinnati, drilling machines, $693,281—80%.

Bell Aircraft Corp., Fort Worth, Tex., helicopters, $2,906,675—75%.

Locomotive Finished Material Co., Atchison, Kan., slush pumps, cast steel freight car frames, $107,612—60%.

Axelson Mfg. Co., Montebello, Calif., component parts for aircraft, $8,012,077—75%.

N. Ransohoff, Inc., metal cleaning and processing equipment, $386,027—80%.

Bill Jack Scientific Instrument Co., Solena Beach, Calif., reconnaissance cameras, $139,303—80%.

General Electric Co., Lynn, Mass., aircraft, $44,326—75%; Everett, Mass., aircraft, $33,389—75%.

Certificates of Necessity announced for week of July 6-13:

American Gage & Machine Co., (Simpson Electric Co., Div.), Chicago, $8,332,000—65%.

Eastern Machinery Co., Cincinnati, machine tools, $250,000—75%.

Stewart Truck Bodies, Inc., Brooklyn, N. Y., truck bodies, $7,300—75%.

Cessna Aircraft Co., Wichita, Kan., observation airplanes, $1,172,348—75%.

Kenworth Motor Truck Corp., Seattle, motor truck parts, $62,125—75%.

Jacobs Mfg. Co., Elmwood Section, W. Hartford, Conn., key type drill chucks, $712,250—80%.

Worthington Pump & Machinery Corp., Buffalo, N. Y., air compressors, generating units, $375,259—85%.

Simonds Saw & Steel Co., Fitchburg, Mass., teeth for wood saws, $1,056,255—75%.

Aeroquip Corp., Jackson, Mich., flexible hose lines, $214,447—85%.

Micromatic Hone Corp., Pendleton, Ind., abrasive honing sticks, $203,800—80%.

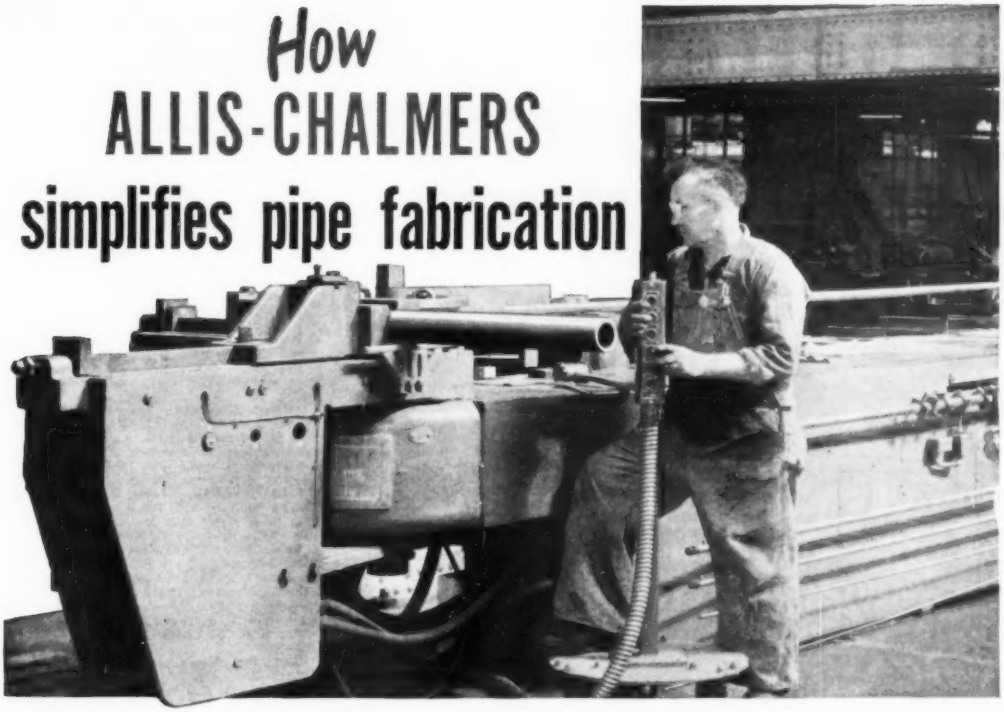
Clayton Mfg. Co., El Monte, Calif., steam cleaning machines, $171,330—80%.

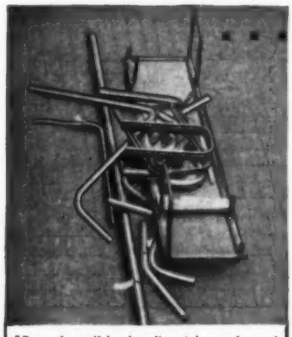
McGill Mfg. Co., Inc., Valparaiso, Ind., ball & roller bearings, $195,000—75%.

Westinghouse Electric Corp., Lima, Ohio, dynamotors, $2,931,300—75%.

Camcar Screw & Mfg. Co., Rockford, Ill., screws, $743,713—75%.

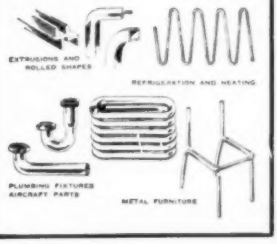
How ALLIS-CHALMERS simplifies pipe fabrication





View of small lot bending jobs performed on Pines Size 4 Automatic Bender. Smooth, accurate bends are formed without wrinkles or distortion.

OTHER TYPICAL PINES BENDING JOBS There's a complete range of Pines Benders designed to profitably handle jobs like these.



with a PINES AUTOMATIC BENDER

Cold Bending Eliminates Costly Pickling Operation

In a centralized pipe fabricating division at the Allis-Chalmers West Allis Works, a wide range of cold bending jobs for production and maintenance needs are now efficiently handled on this Pines Hydraulic Automatic Bender. The machine has ample capacity for handling requirements for pipe and tubing ranging in sizes from 3/4" thru 5". The cold bending principle of the machine, combined with push-button control and automatic operation, reduces manual effort, and cuts costs. *For example,* in place of hot bending, long lengths of 3" oil line piping are now cold formed at speeds five times more efficient. In addition, a costly cleaning and pickling operation is avoided.

Small Lots Handled Profitably—Low Tooling Expense

Further, most small lot jobs are handled profitably. The centralized operation permits standardizing on radii of bends which lowers tooling expense. Simplicity of tooling and quick change-over features of the machine saves set-up time. The capacity and versatility of the equipment also permits handling all types of materials and shapes suitable to cold bending, such as stainless steel and chrome-moly tubing, extra heavy wall piping, channel iron, extruded and structural shapes. Thus, with modernized equipment and skillful engineering, fabricating and assembly work at A-C are greatly simplified.

PINES ENGINEERING CO., INC.

Specialists in Tube Fabricating Machinery

672 WALNUT • AURORA, ILLINOIS

Write **FOR MORE FACTS TODAY**

Find out how Pines Benders may be tooled for your work. Free catalog shows various models and tooling applications on actual jobs.

BENDING • DEBURRING • CHAMFERING • THREADING • CUT-OFF MACHINERY

a better SHAPER

from any angle

Not just a better shaper for the money, but a better size and type shaper for most shops. With capacity for the great bulk of Shaper work, the SHELDON 12″ Back-geared Shaper can be quickly set for any feed from .0025″ to .0175″ per stroke; for any speed from 12 to 180 strokes per minute. Automatic feeds in both directions are available.

Rigidly built, with ribbed and reinforced cast, box-type column and base, with exceptionally wide ways and sturdy parts, SHELDON Shapers stand up under full capacity operation and hold their accuracy. The variable speed drive is completely enclosed in the pedestal, and all controls are within easy reach. This is an easy-to-operate shaper that can be safely turned over to, and profitably operated by, even those with limited shaper experience.

Write for Catalog

SHELDON
CHICAGO

SHELDON MACHINE CO., Inc., 4234 N. Knox Ave., Chicago 41, Ill.

Sylvania Electric Products Co. (Radio & Television Div.), Buffalo, N. Y., ordnance, $67,524—75%.

Lonergan Mfg. Co., Albion, Mich., oil heaters, tent, $7,401—90%.

General Instruments, Inc. (formerly Geophysical Serv., Inc.), Dallas, Tex., ordnance, $256,759—80%.

Continental Machines, Inc., Savage, Minn., sewing machines, $158,558—80%.

General Instruments Corp., Elizabeth, N. J., electronic equipment, $30,612—85%.

Super-Cold Corp., Los Angeles, threading, $17,075—90%.

Kearney & Trecker Corp. (Walker-Turner Div.) Plainfield, N. J., drilling machines, $388,150—80%.

Polarad Electronics Corp., Brooklyn, N. Y., receiving equipment, $18,260—85%.

New York Air Brake Co., Watertown, N. Y., hydraulic pumps, $127,600—75%.

Piasecki Helicopter Corp., Morton, Pa., helicopters, $4,767,020—75%.

Fenn Mfg. Co., Hartford, Conn., helicopter parts, $25,787—85%.

Ross Heater & Mfg. Co., Inc., Buffalo, N. Y., heat exchangers, coolers, heaters, $418,987—80%.

Skinner Chuck Co., New Britain, Conn., lathe chucks, $122,800—85%.

E. G. Reisner Forge Co., South Gate, Calif., steel forgings, $38,000—75%.

Starr Heat Treating Co., Detroit, heat treatment of metal parts, $23,910—75%.

Griffin Wheel Co., Denver, Colo., wheels for freight cars, $266,911—60%.

J. N. Ney Co., East Hartford, Conn., precious metal contacts, $93,833—80%.

Ruland Mfg. Co., Watertown, Mass., springs-valves, $24,200—90%.

Carroll Mfg. Co., Inc., Agawan, Mass., machine tool parts, $192,581—80%.

Cochran Foil Co. (Products Div.) Louisville, Ky., aircraft equipment, $32,056—75%.

Par Mfg. Co., Chicago, aircraft parts, $10,060—90%.

Bonic, Inc., Detroit, assembly (tank engines), $67,315—80%.

Smith-Morris Co., Ferndale, Mich., aircraft, $20,302—80%.

Banner Die Fixture Co., Detroit, inspection gages, $35,283—85%.

International Steel Co., Evansville, Ind., freight car parts, $711,132—60%.

Twin Disc Clutch Co., Rockford, Ill., clutches, $417,863—80%.

Brooks & Perkins, Inc., Detroit, aircraft, $43,243—85%.

Minneapolis-Honeywell Regulator Co., Philadephia, instruments for measuring, $23,822—85%.

Michiana Products Corp., Michigan City, Ind., fuel tanks, oil filters, shower units, $55,000—75%.

William B. Pollock Co., Youngstown, Ohio, blast furnaces, $88,888—60%.

Piasecki Helicopter Corp., Morton, Pa., helicopters, $5,390,929—75%.

Kropp Forge Co., Cicero, Ill., hub and shaft aircraft, $347,549—75%.

Lamson Products Co., Seattle, Wash., screws, nuts, $58,352—80%.

Barker & Williamson, Inc., Bristol, Pa., teletypewriter stations, $36,643—85%.

Western Gear Works, Seattle, gears, $27,500—90%.

Weston Hydraulics, Ltd., N. Hollywood, Calif., aircraft hydraulic valves, $67,117—85%.

Harris Metals Treating Co., Racine, Wis., heat treating metals, $10,877—75%.

Mid-Western Industries, Inc., Wichita, Kan., airplane parts, $25,653—80%.

Great Lakes Mfg. Corp., Cleveland, aircraft, $19,670—75%.

C. M. Smillie & Co., Ferndale, Mich., aircraft, $16,397—90%.

Aircraftsmen Co., Inglewood, Calif., aircraft, $39,880—75%.

Telectro Industries Corp., Long Island City, N. Y., aircraft fuel gage, $61,600—75%.

Doelcam Corp., Newton, Mass., gyroscopes, $319,994—80%.

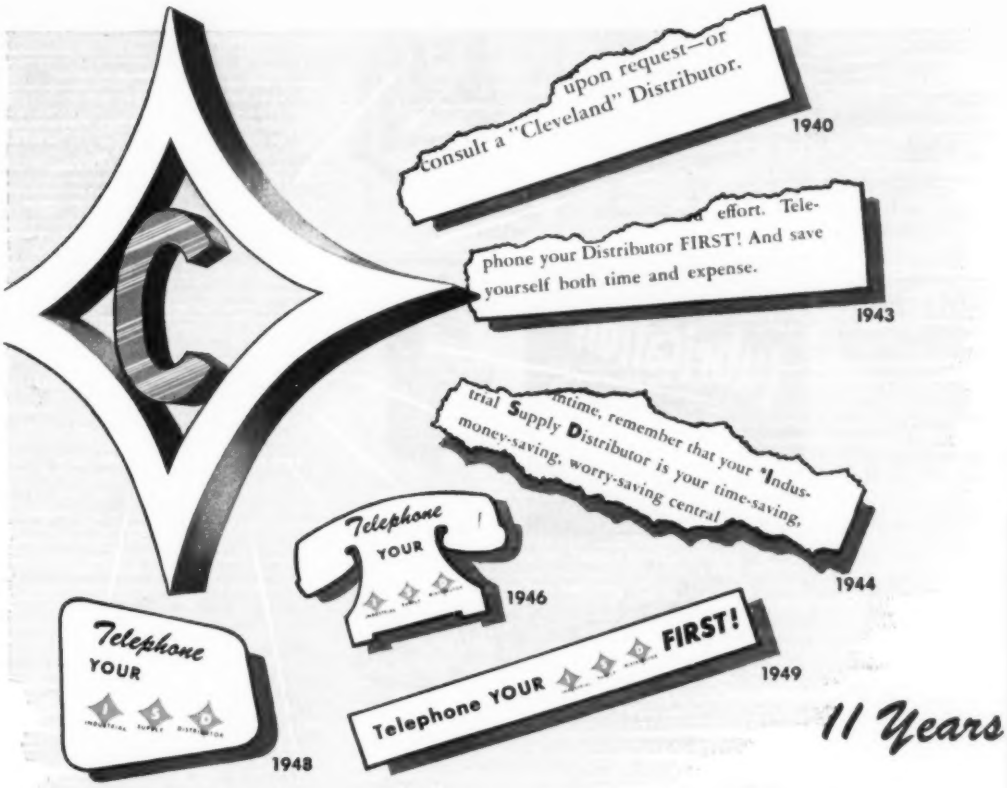
Arma Corp., Mineola, N. Y., fire control equipment, $5,500,000—75%.

Cabot Shops, Inc., Kingsmill, Tex., gun tube forgings, $180,115—75%.

Westholt Mfg. Inc., Wichita, Kan., aircraft, $13,855—80%.

L. L. Constantin & Co., Lodi, N. J., metal evaporation machines, $3,978,300—50%.

Spokane International RR Co., Spokane, Wash., railroad flatcars, $406,568—80%.



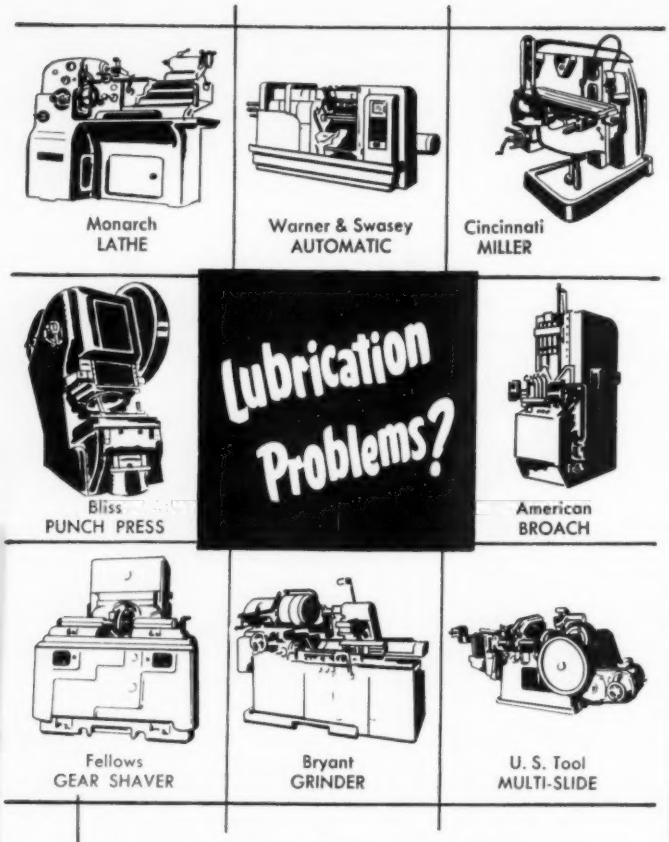
Telephone Your Industrial Supply Distributor

For more than ten years we have been reminding you to "Telephone Your Industrial Supply Distributor" for prompt, dependable service on *Cleveland* Twist Drills, Reamers and other tools bearing the famous ◇ trade mark. The arrangement of the words has been changed from time to time, as illustrated above—but the message always has been the same.

Since 1940 we have been making this suggestion month after month in all of our advertising—and it's just as timely today. Whatever tools, equipment or supplies you may require, you will save time and money by calling your Industrial Supply Distributor *first.* Even in the case of hard-to-get items, you'll find that often he is able to speed deliveries. For your Distributor is a favored customer of many factories; he has "first call" on their production.

THE CLEVELAND TWIST DRILL CO.
1242 East 49th Street • Cleveland 14, Ohio
Stockrooms: New York 7 • Detroit 2 • Chicago 6 • Dallas 2 • San Francisco 5 • Los Angeles 58
E. P. Barrus, Ltd., London W. 3, England

CLEVELAND DISTRIBUTORS EVERYWHERE Are Ready to Serve You



not on these machines!

...they're all BIJUR equipped

Every one of these machines is designed for continuous production. This is made possible by the built-in Bijur lubricating system. It oils the machine during operation and reduces bearing wear by controlling oil feed *at the bearings*. In both cases, it converts down-time for maintenance into more time for production. When you buy a Bijur-lubricated machine, you're assured of built-in bearing protection.

754

Write for Bulletin MW

BIJUR

LUBRICATING CORPORATION

Rochelle Park • New Jersey

Hewlett-Packard Co., Palo Alto, Calif., test and measuring instruments, $301,772—80%.

Trigon Machine & Tool Corp., Greenbrook Township, N. J., machine cast parts, $41,723—80%.

Wright Machinery Co., Durham, N. C., antenna assemblies, $12,697—90%.

National Machinery Co., Tiffin, Ohio, forging machines, $328,273—80%.

Manning, Maxwell & Moore, Inc., Stratford, Conn., aircraft, $940,114—75%.

Torrington Mfg. Co., Torrington, Conn., spring coiling machines, $85,570—90%.

Certificates of Necessity announced for week of July 13-20:

Hammel-Dahl Co., Providence, R. I., automatic valves, $29,802—90%.

Connecticut Spring Corp., Hartford, Conn., springs, $9,248—75%.

Marlin Rockwell Corp., Plainville, Conn., bearings, $13,118—75%.

Burndy Engineering Co., Inc., Norwalk, Conn., electrical connectors, $500,000—75%.

International Nickel Co., Inc., Bayonne, N. J., castings, $64,951—75%.

Bendix Aviation Corp., Teterboro, N. J., aircraft instruments, $1,138,237—75%.

Sacks-Barlow Foundaries, Inc., Newark, N. J. iron castings, $442,798—75%.

Davis-Larchmont Corp., Larchmont, N. Y., valve parts for hydraulic controls, $3,274—75%.

Orange Roller Bearing Co., Inc., Orange, N. J., needle bearings, $372,833—85%.

Thomson Industries, Inc., New Hyde Park, N. Y., ball bushings, $209,400—85%.

Bearing Co. of America, Lancaster, Pa., ball bearings, $149,216—85%.

Arcos Corp., Philadelphia, electrode welding, $219,300—75%.

National Forge & Ordnance Co., Irvine, Pa., ordnance, $637,088—80%.

Nice Ball Bearing Co., Philadelphia, anti-friction bearings, $1,573,251—85%.

Universal Ball Co., Willow Grove, Pa., precision balls, $244,750—85%.

Palmer Wellock Tool Corp., Meadville, Pa., tank trend forgings, $11,200—90%.

Rockwell Mfg. Co., Tupelo, Miss., drill units, drill presses saws, $1,315,491—80%.

Thompson Products, Inc., Cleveland, Ohio, aircraft parts, $1,742,857—75%.

Goodyear Tire & Rubber Co., Akron, Ohio, wheels for tanks, $228,390—80%.

Monroe Auto Equipment Co., Monroe, Mich., ordnance, $48,858—85%.

Surface Combustion Corp., Columbus, Ohio, engine heater, $10,960—75%.

Ford Motor Co., Livenia, Mich., tanks, $22,099,642—75%.

Chrysler Corp., Warren Twp., Mich., military trucks, $223,513—75%.

McNeil Machine & Engr. Co., Akron, Ohio, tire curing presses, $1,044,972—75%.

Monroe Auto Equipment Co., Monroe, Mich., ordnance, $16,122—75%.

Pioneer-Toledo Corp., Toledo, Ohio, aircraft parts, $90,000—90%.

Kaydon Engineering Corp., Muskegon, Mich., bearings, $287,000—85%.

Timken Roller Bearing Co., Canton, Ohio, roller bearings, $870,955—75%; Bucyrus, Ohio, roller bearings, $3,768,273—75%; Columbus, Ohio, roller bearings, $569,585—75%; Zanesville, Ohio, roller bearings, $82,450—75%.

General Motors Corp., Livonia, Mich., transmissions assemblies, $15,322,556—75%; Tonawanda, N. Y., aircraft, $20,844,000—75%; Flint, Mich., aircraft parts, $15,246,000—75%.

Bell & Howell Co., Lincolnwood, Ill., sniperscope, tank periscope, $1,294,722—75%.

Torrington Co., Inc. of Ind., South Bend, Ind., anti-friction bearing, $1,471,172—75%.

Indianapolis Machinery & Supply Co., Inc., Indianapolis, rebuilding machine tools, $136,465—80%.

Link-Belt Co., Indianapolis, ball bearings, $648,230—75%.

American Gage & Machine Co., Aurora, Ill., voltmeters, $14,589—75%.

Cessna Aircraft Co., Hutchinson, Kan., aircraft assemblies $106,139—75%.

Certificates of Necessity announced for week of July 20-27:

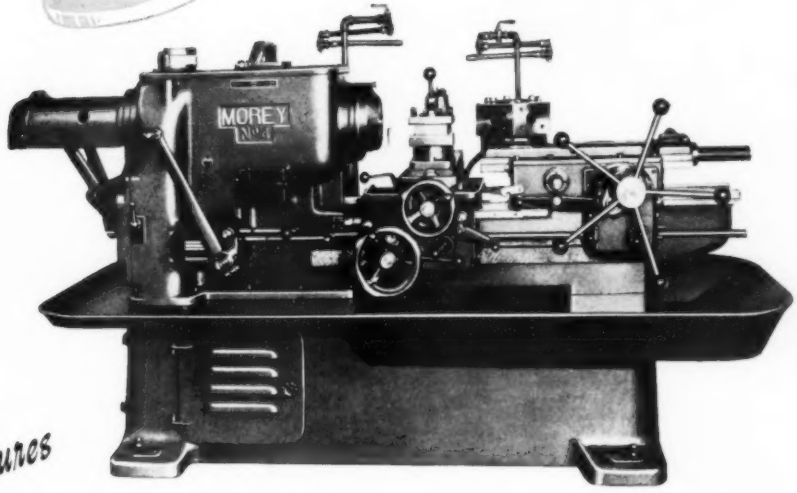
Noma Electric Corp., Derby, Conn., submarine power cable, $174,000—75%.

MOREY

TURRET LATHES

No. 2 Plain Type

Nos. 3, 4 and 5 Universal Type



Features

Infinite variable vibrationless spindle speeds.

Remote speed selection control for speed and ease of operation.

The newly designed MOREY TURRET LATHES take advantage of tungsten carbide tools and incorporate all technical improvements in metals, electronics and hydraulics . . . our design is not hampered by tradition.

Size	Bar Capacity	Swing	Motor
No. 2 Plain	1" x 6"	14"	3 HP
No. 3 Universal	1 1/2" x 10"	16 1/2"	5 HP
No. 4 Universal	2" x 12"	19 1/2"	7 1/2 HP
No. 5 Universal	2 1/2" x 14"	21 1/4"	15 HP

FOR BAR and CHUCKING WORK

OBTAIN MAXIMUM PRODUCTION WITH MINIMUM EFFORT FROM MOREY TURRET LATHES . . . **INVESTIGATE!**

MOREY MACHINERY CO. INC.

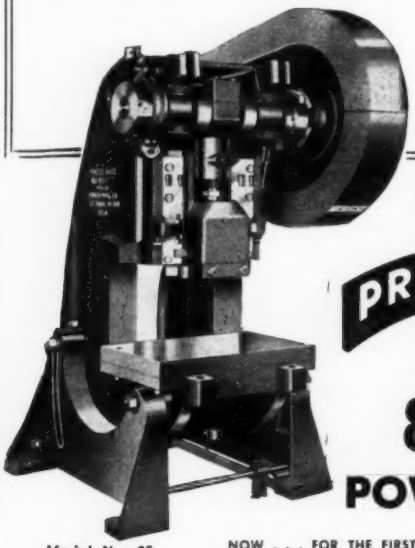
406 BROOME ST., NEW YORK 13, N.Y.

Cable Address: WOODWORK, N.Y.

Telephone: CAnal 6-7400

YES...

we can furnish an AIR FRICTION CLUTCH



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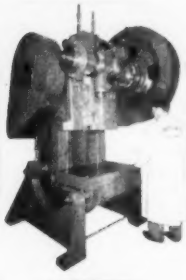
85 TON POWER PRESS

Model No. 85



Model No. 85 Back-Geared

NOW . . . FOR THE FIRST TIME . . . the famous Press-Rite No. 85 is available with a smooth-operating, power-conserving Air Friction Clutch . . . plus the positive safeguard of a spring-applied brake. Thus we have added to the many proven advantages of this Press-Rite giant—Built-In Tie Rod Frame, Triple Ramway Lubrication, extra heavy construction throughout — the simplest, safest, most durable and most efficient clutch-brake arrangement ever introduced into the power press field!

ENGINEERED FOR SAFE OPERATION—The new Press-Rite Air Friction Clutch goes a long way toward eliminating damage to dies or to the press . . . while providing maximum protection against injury to the operator. The clutch and brake cannot be engaged simultaneously—when the clutch is engaged, the brake is instantly released, and vice versa. If air supply or electric power fails, the clutch releases and the brake immediately stops the ram. Clutch gripping pressure can be regulated to suit the operation, thus avoiding damage to jammed dies or to the press.

CLUTCH-BRAKE MAINTENANCE PRACTICALLY ELIMINATED—The design of the new Air Friction Clutch virtually limits wear to brake and clutch linings. Seal-packed flywheel bearings, inter-locking Clutch-Brake arrangement—these factors permit operation for years, with neither repair nor adjustment.

FOR STAMPING, BLANKING, DRAWING, FORMING and PUNCHING . . . there's a Press-Rite that's right for you. Seven models available . . . capacities 5 to 85 tons.

WRITE FOR FULL INFORMATION, TODAY!

Sales Service Machine Tool Co.

PRESS-RITE DIE PRESSES · SHAPE-RITE SHAPERS · KELLER POWER HACK SAWS

2347 UNIVERSITY AVENUE
ST. PAUL 4, MINNESOTA

Greenman Steel Treating Co., Worcester, Mass., commercial heat treating, $49,500—60%.

American Bosch Corp., Springfield, Mass., tank telescope mounts, $389,528—80%.

Marlin Rockwell Corp., Jamestown, N. Y., ball bearings, $2,539,434—75%.

Sperry Corp., Great Neck, N. Y., precision scientific instruments $1,519,790—75%.

Wm. Steinen Mfg. Co., Newark, N. J., screw machine parts for aircraft, $84,514—90%.

REF Mfg. Corp., Mineola, L. I., N. Y., hatches for aircraft, $163,842—75%.

Empire Steel Castings, Inc., Temple, Pa., steel castings, $603,606—75%.

R—S Products Corp., Philadelphia, industrial valves, $27,917—90%.

Blaw-Knox Co., Pittsburgh, turrets (tanks), $800,000—75%.

Kennametal, Inc., Latrobe, Pa., ordnance, $648,191—80%.

Superior Steel Corp., Carnegie, Pa., ordnance, $1,527,086—75%.

Hastings Instrument Co., Inc., Hampton, Va., electronic receivers and indicators, $255,315—80%.

Parker Appliance Co., Cleveland, gaskets, $201,370—85%.

Timken Roller Bearing Co., Canton & Perry Twps, Stark Co., Ohio, roller bearings, $747,695—75%.

Butcher & Hart Mfg. Co., Toledo, Ohio, lockwashers, screw assemblies, $19,520—85%.

Hancock Steel Co. Inc., Detroit, metal services, $348,814—60%.

General Motors Corp., Lansing Mich., aircraft parts, $9,155,000—75%.

Deslauriers Column Mould Co., Inc., Detroit, rotor governors, $35,695—80%.

Barth Stamping & Machine Works, Inc., Cleveland, Tools & dies, $589,933—80%.

McKay Machine Co., Youngstown, Ohio, metalworking machinery, $147,492—60%.

Buda Company, Harvey, Ill., diesel engines, $25,839—75%.

Master Machine & Tool Co., Chicago, machining metal parts, $66,045—80%.

General Scientific Corp., Chicago, mounts (aircraft cameras), $26,520—85%.

Larson & Quigley Co., Chicago, locklug, $70,000—75%.

Bailey Products Corp., Union City, Ind., parts, fuze, $14,000—90%.

Lyons Machine & Mfg. Co., Lyons, Kan., aircraft parts, $34,879—90%.

Whitney Chain Co., Longview, Tex., power transmission chain, $3,866,137—75%.

United Aircraft Corp., Dallas, Tex., aircraft, $1,578,032—75%.

McCulloch Motors Corp., Los Angeles, aircraft engines, $2,069,695—80%.

Boeing Airplane Co., Seattle, Wash., aircraft, $8,485,000—75%.

H. M. Harper Co., Morton Grove, Ill., bolts, nuts, rivets, $91,000—80%.

Farrel-Birmingham Co., Inc., Darby, Conn., rubber machinery, $1,666,000—80%.

Certificates of Necessity announced for week of July 27-August 3:

Heppenstall Co., Bridgeport, Conn., steel forgings, $74,532—75%.

Torrington Co., Torrington, Conn., antifriction bearings, $625,000—75%.

Caval Tool & Machine Co., Newington, Conn., aircraft parts, $56,423—80%.

Threadwell Tap & Die Co., Greenfield, Mass., taps, dies, $212,709—85%.

Morse Twist Drill & Machine Co., New Bedford, Mass., forgings for lock nut, $40,000—85%.

Buerk Tool Works, Buffalo, N. Y., aircraft assemblies, $17,517—90%.

Gleason Works, Rochester, N. Y., bevel gears, $177,728—75%.

Airborne Instruments Laboratory, Inc., Mineola, N. Y., antennas, $117,810—80%; Hempstead, N. Y., antennas, $738,380—80%.

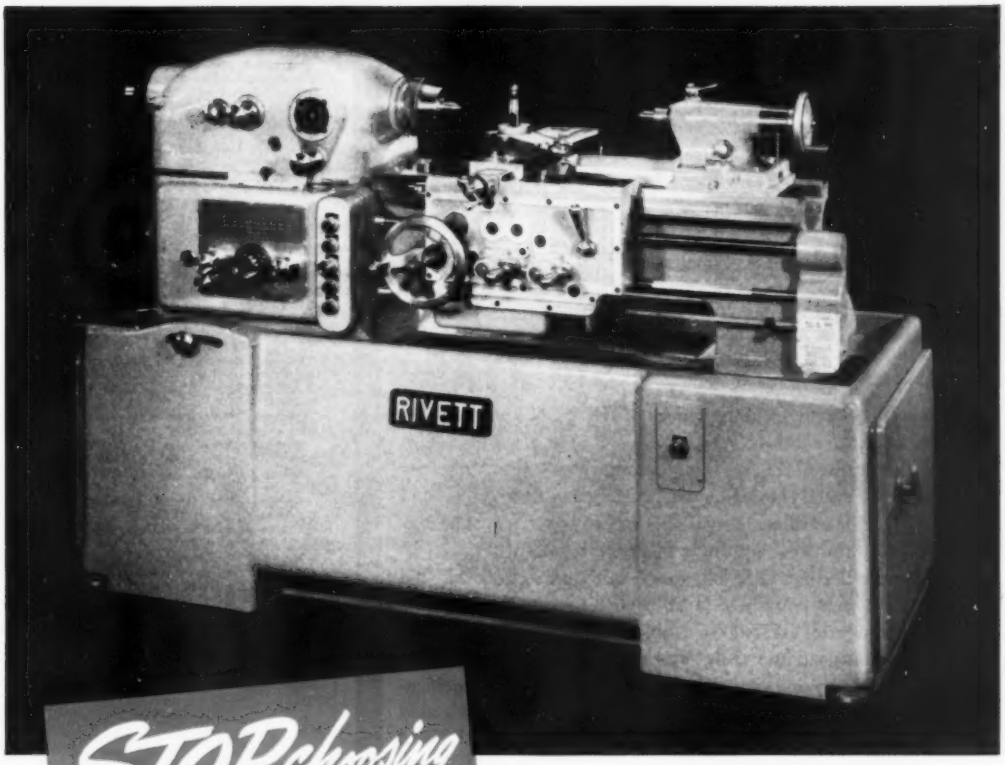
DeLaval Steam Turbine Co., Trenton, N. J., steam turbines & pumps, $152,936—85%.

Standard Steel Spring Co., New Castle, Pa., flat leaf springs, $78,238—80%.

Landis Tool Co., Waynesboro, Pa., grinding machines, $1,543,667—75%.

Joy Mfg. Co., Franklin, Pa., mining machinery, $264,136—50%.

Diebold, Inc., Canton, Ohio, castings for tanks, $95,357—75%.



STOP choosing work for a lathe!

The NEW RIVETT 1020S TOOLROOM LATHE

Turns anything it can swing!

RIVETT 1020S has what it takes to make an outstanding lathe!

■ 40% heavier than comparable lathes. Weighs 4000 lbs. ■ Back gearing for power cuts—belt drive for high speed. Range from 22 to 3600 R.P.M. ■ 12¾" wide hardened steel ways of bed absorb heavy cutting force. ■ High spindle speeds through mechanical drive. ■ Push button controls for complete operation. ■ Neutral clutch stops spindle without stopping drive. ■ Three bearing mounts for spindle. ■ Collets mount directly in spindle. ■ Hand wheel for turning headstock spindle. ■ Anti-friction bearings used throughout. ■ Gear box gives 72 feeds and 84 threads from 2 to 240 per inch. ■ Automatic lubrication. ■ Hardened and ground feed screws.

There's no problem in selecting types of work to suit the lathes in your shop when you have 1020S Rivetts. This double-duty machine combines the extreme precision of an instrument lathe and the ruggedness of an engine lathe. Feather-touch sensitivity at high speeds; rugged power in back gearing—it qualifies for any toolroom turning within its 12½" swing and 20" centers.

Features at left indicate how outstanding the new 1020S lathe really is—for further proof of how outstanding it would be in your shop, **write for Bulletin No. 1020A.**

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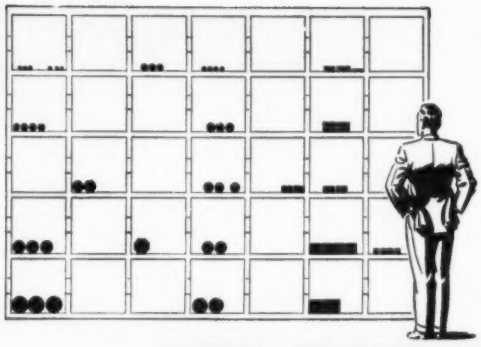
For More Precision Work *RELY ON RIVETT LATHES AND GRINDERS,* The Master Craftsman's Master Tools

OVER ONE HUNDRED YEARS OF CONTINUOUS SERVICE... ROUNDS, SQUARES, FLATS, HEXAGONS, OCTAGONS

BILLETS AND FORGINGS FOR PRODUCTION, TOOL ROOM AND MAINTENANCE REQUIREMENTS.



The present serious STEEL SHORTAGE

has reduced our warehouse stocks of HY-TEN and Standard alloy steels to a sub-normal level.

This inventory situation is, of course, very unsatisfactory but we are doing everything we possibly can to improve it.

Our aim is to allocate available stocks to our customers in the fairest and most equitable way possible.

Defense certifications on your warehouse orders will aid us greatly in supplying your alloy steel needs.

In the light of current conditions, we suggest that you put our metallurgical knowledge and experience to work for you.

It frequently happens that, when certain exact specifications are not available, our metallurgists can recommend entirely suitable substitute materials or alternate methods of manufacture and treatment.

Your nearby Wheelock, Lovejoy representative knows metallurgy. He stands ready to give you expert assistance in solving your problems.

Write today for your FREE COPY of the Wheelock, Lovejoy Data Book, indicating your title and company identification. It contains complete technical information on grades, applications, physical properties, tests, heat treating, etc.

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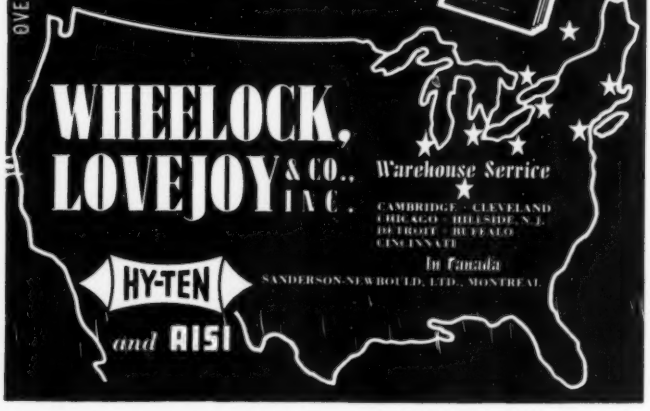

Dow Chemical Co., Midland, Mich., magnesium die casting, $227,421—75%.

Teer, Wickwire & Co., Jackson, Mich., tank trackpins, bushings, $123,129—80%.

Universal Products Co., Dearborn, Mich., ordnance, $372,489—80%.

Falls Industries, Inc., Solon, Ohio, heat exchangers, valves, $45,147—80%.

Pipe Machinery Co., Cleveland, gages, $50,450—90%.

National Acme Co., Cleveand, machine tools, $299,158—85%.

White Motor Co., Cleveland, tank assemblies, $413,170—85%; engines for half-tracks, $58,937—85%.

Eaton Mfg. Co., Marshall, Mich., rotor pumps, $882,156—80%.

Morse Instrument Co., Hudson, Ohio, military photographic equipment, $57,445—75%.

Buhr Machine Tool Co., Ann Arbor, Mich., drilling machine, $186,493—80%.

Canton Drop Forging & Mfg. Co., Canton, Ohio, ordnance, $538,822—75%.

Colonial Broach Co., Detroit, broaching machines, $185,130—80%.

General Motors Corp., Moraine City, Ohio, parts for propeller, $4,108,230—75%; aircraft, $5,713,823—75%; Grand Blanc, Mich., tanks, $1,578,218—75%.

Alliance Structural Co., Alliance, Ohio, cranes, $846,723—75%.

Hydraulic Press Mfg. Co., Mt. Gilead, Ohio, hydraulic presses, $486,500—75%.

Toledo Scale Co., Toledo, tank control box, $605,400—80%.

Operadio Mfg. Co., St. Charles, Ill., electronic amplifiers, $324,500—75%.

Chisholm, Boyd & White Co., Chicago, Boyd press, $30,816—90%.

National Automatic Tool Co., Richmond, Ind., boring machine tools, $426,357—80%.

O.A. Sutton Corp., Wichita, Kan., ordnance, $268,405—80%.

Schulz Tool & Mfg. Co., Inc., San Gabriel, Calif., control valves, $23,087—90%.

Lovequist Engr. Co., Los Angeles, machining of metallic parts, $25,775—75%.

Cascade Mfg. Co., Portland, Ore., truck attachments, $109,395—90%.

Distributors Named

• **Rudel Machinery Co., Inc.**, New York, now represents Giddings & Lewis Machine Tool Co., Fond du Lac, Wis., as distributor in all of New York State, in Connecticut, and in northern New Jersey.

• **Niagara Machine & Tool Works**, Buffalo, N. Y., has appointed Austin-Hastings Co., Cambridge, Mass., sales representative in all New England except Connecticut.

• **Ready Tool Co.**, Bridgeport, Conn., has appointed Kern & Collins, Inc., as export managers, charged with world-wide distribution of RED-E products.

• **Cleco Div., Reed Roller Bit Co.**, Houston, Tex., has appointed the following distributors: Highway Machinery & Supply Co., Inc., Richmond, Va.; Sterling Sales, Inc., Worcester, Mass.; Wallner Welding Supply Co., Duluth, Minn.; Franklin Supply Co., Providence, R. I.; J. Heller & Sons, Inc., Newark, N. J.; Somerset Pneumatic, Inc., Somerville, N. J.; Red Arrow Sales Corp., Madison, Wis.; Martin Mfg. Co., Los Angeles; Knox-Tenn Equip-

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HELPS YOU IMPROVE YOUR PRODUCT!

New materials and better manufacturing methods contribute improvement to a product no less than new and better design. How can the manufacturer know when there is something new that applies particularly to his product or operation?

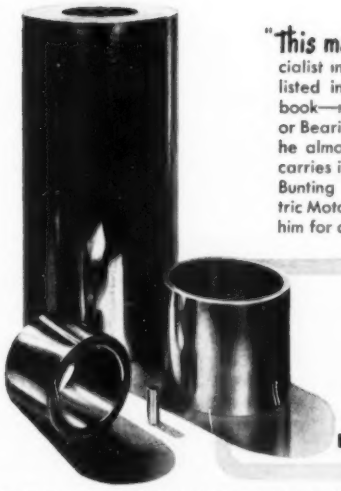
Just leave the door open and a man will call to tell all about the new things—machines, materials and methods—in modern manufacturing. Often he will bring to your attention something that is "right up your alley". It is his business to know, and he is constantly on the lookout for new things you can use.

If you don't want to wait for his call, phone him.

Responsible

"This man" is an industrial distributor or a specialist in certain industrial items. You will find him listed in the classified section of your telephone book—most likely under the heading Bars, bronze or Bearings, bronze. If he is the leading distributor, he almost certainly is the Bunting Distributor. He carries in stock for your money saving convenience Bunting Standard Stock Industrial Bearings, Electric Motor Bearings, and Precision Bronze Bars—ask him for catalog.

There are approximately 2000 Industrial Distributors serving every industrial section of the United States. In 1948 their total sales were more than $5,000,000,000. They carry an average inventory of $500,000,000, turn their stocks 5 to 6 times per year, fill 200,000 orders per day, have 12,000 outside salesmen and engineers, 10,000 inside telephone order expeditors, operate 8000 trucks delivering merchandise on which their average net profit is .0292 cents per dollar of sales.



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FULL SPEED AHEAD

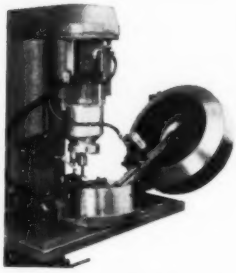
IS THE PRESENT-DAY DEMAND

and You Can Command It With

D.P.S. MOTORIZED
Selective Feeding
HOPPER UNITS

Hopper feeding 30 caliber shell discs, concave side up, to press for drawing operations.

Modern production methods demand more speed and accuracy in the selection and feeding of parts than can be accomplished by hand . . . Our 25 years experience as pioneers in the assembly field enables us to ably meet this demand with the D.P.S. Motorized Hopper Units, the outstanding selective feeding devices with which production parts of a wide variety are selected, oriented and fed in a given position for primary and secondary operations . . . They are a completely self-contained unit, including drive and feed track. They are easily adaptable to presses, centerless grinders, thread rolling and slotting machines, also special machines . . . Six sizes, 8", 10", 12", 16", 24" and 30" diameters for handling various sizes of parts. No matter what your feeding problem is, we can meet your requirements. Designers of special equipment will also be interested.



Sixteen-inch hopper mounted on tapping machine equipped with air-operated dial—completely automatic operation.

Send for further details, also information about D.P.S. Power Screwdrivers, Nut Drivers and Special Assembling Machines.

Counting and feeding hopper with adjustable escapement to accommodate varying quantities.

1926 Our 25th ANNIVERSARY 1951

DETROIT POWER SCREWDRIVER CO.

2797 W. FORT ST. **DETROIT 16, MICHIGAN**

ment Co., Knoxville, Tenn.; Vogl Tool Co., Kansas City, Mo.; R. D. Price Associates, Springfield, Mass.; Dawson Tool & Abrasive, Inc., Seattle; Cohen Auto Parts, Inc., Erie, Pa.; Keystone Builders Supply Co., Inc., Rochester, N. Y.; Pit & Quarry Equipment Co., Indianapolis; and Hays Supply Co., Memphis, Tenn.

• **Cleveland Tapping Machine Co.,** a subsidiary of Automatic Steel Products, Inc., Canton, Ohio, has appointed the following dealers: McVoy-Hausman Co., Birmingham, Ala.; Charles W. Stone Co., Minneapolis; John S. Young Co., Ltd., Glasgow, Scotland.

• **Hilliard Corp.** has named Guy T. Martin & Co., Gardena, Calif., as West Coast representative.

• **Ampco Metal, Inc.,** Milwaukee, has named R. J. Greer Equipment Co., Syracuse, N. Y., as distributor in New York State, except metropolitan New York.

• **Detroit Broach Co.** has appointed J. E. Polhemus as representative for southern and eastern Wisconsin, with headquarters at 833 E. Kilbourn Ave., Milwaukee.

• **Watson-Stillman Co.,** Roselle, N. J., has appointed Don W. Patterson Co., Buffalo, N. Y., as sales representative in western New York State.

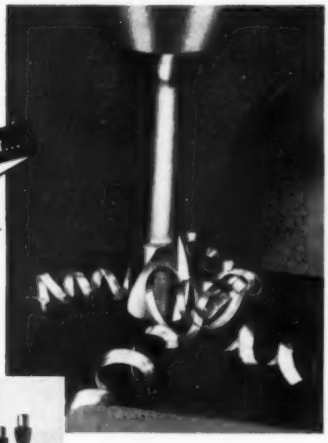
• **Carl Hirschmann Co.,** Manhasset, N. Y., has been named U.S. representative for Karl Huller Ludwigsburg (Germany), precision tapping machines, and for thread rolling machines and precision thread rolling dies of Thommen, S. A., Waldenburg, Switzerland.

• **Hyster Co.,** Portland, Ore., has named Freeman & Sons, Inc., Miami, Fla., dealers for the Hyster line of lift trucks, mobile cranes and straddle trucks in the 13 counties of south Florida.

• **E. Horton & Son Co.,** Windsor Locks, Conn., has appointed Flack Equipment Co., Dayton, Ohio, as distributor in the Dayton area.

• **Carboloy Dept.** of General Electric Co., Detroit, has appointed Tools & Abrasives, Inc., Ft. Wayne, Ind., as distributor for that area. Peaslee-Wells, Inc., West Springfield, Mass., was named distributor for western Massachusetts, eastern Vermont and western New Hampshire.

WELDON
"TU-LIP" COUNTERBORES



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FAST, FREE CUTTING

As the name implies, WELDON "Tu-Lip" counterbores have only two cutting lips or flutes. This feature, together with the fast spiral, makes the "Tu-Lip" the fastest, freest cutting counterbore on the market.

Breakage due to clogging is prevented because this improved cutting tool provides more than ample chip room. Furnished singly in sizes desired or in convenient wood block sets as illustrated.

Weldon distributors throughout U. S. A. and Canada carry complete stocks to serve you.

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Ford Motor Co.
saves 96.5%
on COOLANT FILTRATION COSTS with HONAN-CRANE Equipment

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These case histories and "Clean Oil Bulletins" describe how industrial plants, large and small, save thousands of dollars annually with Honan-Crane Oil Purification and Handling Equipment.

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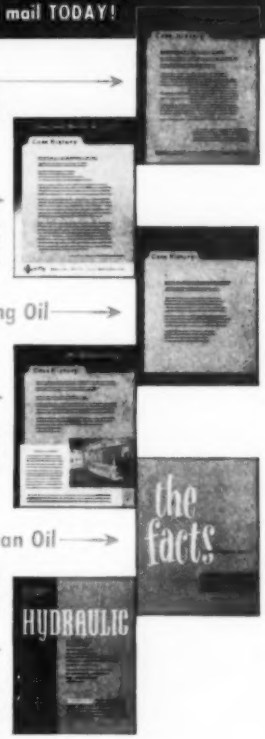

Soluble Oil Coolant →
☐ Case Histories: Ford Motor Company and Milwaukee Gas Specialty Co.

Chip and Waste Removal →
☐ Case Histories: Manufacturer of Fine Automobiles and Minneapolis Electric Castings Company. (Houdaille Conveyor Systems.)

Machine Tool Cutting Oil →
☐ Case History: Wagner Electric Corp., St. Louis.

Oil Quenching →
☐ Case Histories: Cleveland Graphite Bronze Co., Ft. Wayne Works of International Harvester and Salisbury Axle Division of Dana Corporation.

The Facts About Clean Oil →
☐ 14-Page booklet describes highly profitable advantages of oil purification in wide variety of industries. Gives brief case histories.

Hydraulic Bulletin →
☐ 8-Page booklet tells how Honan-Crane Equipment reduces downtime and costly repairs on hydraulic presses, machine tools, plastic molding machines, etc.

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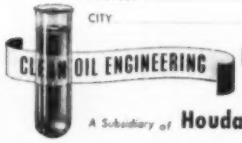

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A Subsidiary of **Houdaille-Hershey Corp.**

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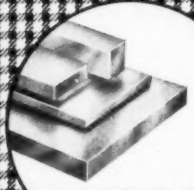

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AMERICAN SAW
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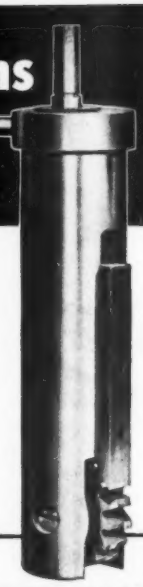
SPRINGFIELD 1, MASS.
"The Tools in the Plaid Box"

10 Good Reasons

why YOU should use NATIONAL Keyseating Millers on your next job



They will mill keyseats:

- in one cut.
- in offset holes.
- that are straight.
- with parallel sides.
- partly through holes.
- for interchangeable parts.
- without clamping the work.
- of standard width and depth.
- in holes that are closed at one end.
- where keyseating machine can't reach.

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complete, handy size

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You have to hand it to Helen's boy friend, he certainly adapted himself to the situation. The same goes for TIPALOY Resistance Welding Electrodes . . . They produce high quality work . . . faster with less mushrooming . . . less redressing and greater current density, cut production costs yet cost no more than the ordinary electrode!

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Full information on the complete line of FCC Smooth Hammered Forgings . . . Rings, Hubs, Discs, Sleeves and other Forged Shapes; Intricate Shapes, Forgings for Hot Work Tools, etc.

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BROAD experience—over a period of many years—in forging tool and die blanks for almost every conceivable hot-work application has fitted our Forging and Casting Division to deal expertly with any problems that may arise in this exacting field.

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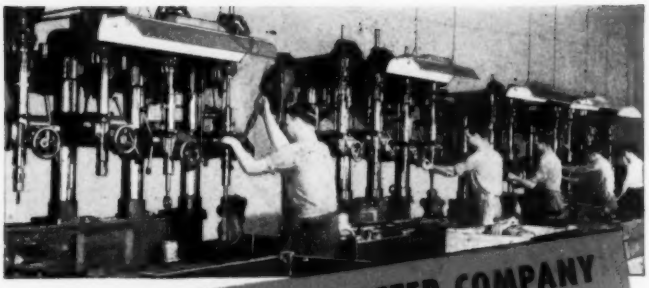
AL FINE TOOL STEELS SINCE 1854



HOW THE AMERICAN METER COMPANY *Stepped Up* REGULATOR OUTPUT

"Buffalo" NO. 22 DRILLS

It takes a lot of accurate drilling, reaming and tapping to produce those high-quality regulators at the Erie Plant of the American Meter Company! Above, you can see how the problem has been handled—with single and multiple spindle "Buffalo" No. 22 Drills. Here a maximum number of operations are performed simultaneously, with minimum set-up time. Note the overall rugged construction (spindle diameter is 1.312", column diameter is 5.5"). Controls are easily reached. Let these accurate machines solve your drilling problem!

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BUFFALO FORGE COMPANY

509 Broadway Buffalo, New York

CANADIAN BLOWER & FORGE CO., Ltd., Kitchener, Ont.

"Buffalo"

DRILLING PUNCHING CUTTING SHEARING BENDING

From the *American Machinist* Library of *Tips for Top Shop Men*

SLAVERY was not abolished by Lincoln. He did end physical slavery, but man himself must end mental slavery to habit. Education will help, but the real problem is to breed a race of open-minded, inquiring men who welcome the chance to wonder, to question and to analyze—then to take a chance on a new idea that looks sound.

PROCEDURE for methods improvement: Pick an operation to be improved. Put down in writing what happens—the details. Challenge each detail in order. Where a chance for improvement appears, develop the better method. Apply it on the job.

How efficient is YOUR shop?

Over 42 per cent of metalworking production equipment is now over ten years of age . . . 19 per cent of it was bought more than 20 years ago!

This means that there is more over-age and obsolete production equipment operating in metalworking shops now than in 1945, and the rate of obsolescence is growing.

How about your shop? Are you equipped adequately with the modern, high-efficiency machinery and equipment which alone can produce the better products that cost *less to buy* which everybody wants? How does your shop compare with those of your competitors, and with metalworking shops generally?

You can find out quickly by writing for a copy of the *American Machinist* Mid-Century Inventory of Metalworking Production Equipment. Here are all the facts on the age and number of 155 major types of production equipment, operating in 15 manufacturing divisions and 25 major production areas. Price: $2.00 per copy.

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Save Costly Hours in TOOL ROOM, PRODUCTION, SALVAGE

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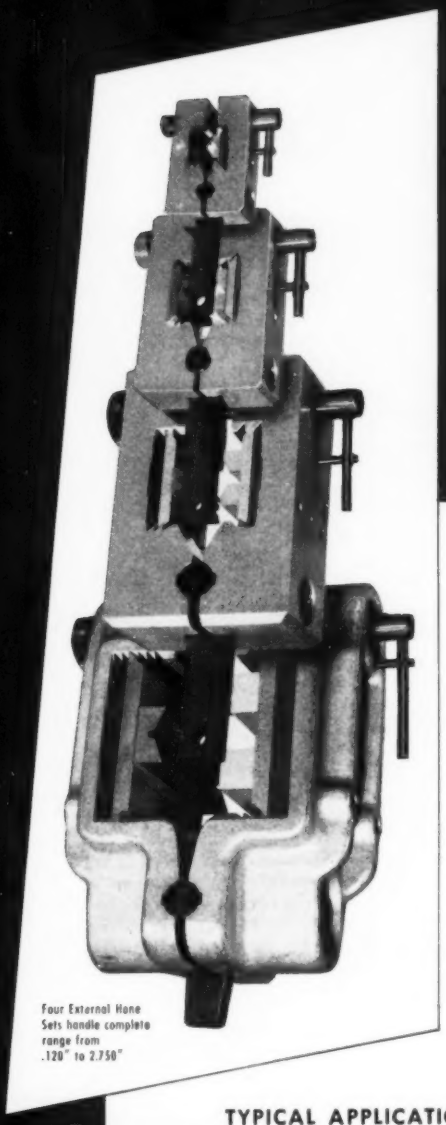

Four External Hone Sets handle complete range from .120" to 2.750"

Ideal for sizing and finishing PINS, SHAFTS, SPINDLES, PLUNGERS, PISTONS, ARBORS, and other parts with diameters between .120" and 2.750"

Sunnen external hones use rigidly mounted abrasive stones... provide controlled stock removal, to the "last tenth"... produce any desired surface finish... are easy to use.

These precision tools enable you to:

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- Produce surface finish to 2 Micro-inches in steel.
- Correct heat treat warpage, out-of-round, taper, barrel, and waviness.
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- Produce parts with perfect working surfaces and the smooth, criss-cross surface finish that's best for holding lubricants.

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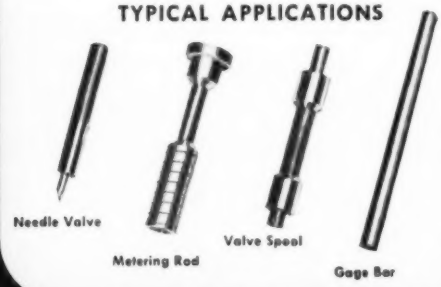

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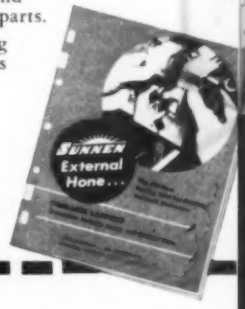

To: SUNNEN PRODUCTS CO.
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☐ Please send bulletin on external honing. ☐ Have representative call.

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City.....Zone.....State.....

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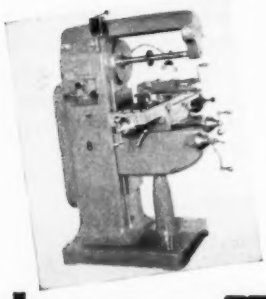
Model 55 IMPROVED VERTICAL MILL. A speed range of 80 to 2700 RPM's combines with a 1 H.P drive, 3¼" quill, and extra rugged spindle mounted on over-size precision ball bearings to give a capacity of ⅛" to 1½" end mills in steel. Spindle quill travel is 5¼" either by lever, hand wheel, or power, and has adjustable positive stop and automatic safety throw-out. Table 40" x 9" or larger. Longitudinal table power feed has 8 geared feed changes.



Model 60 PLAIN HORIZONTAL MILL. A full No. 1, that in many ways equals or exceeds a light No. 2 in capacity. Low maintenance due to all rapid moving parts running in oil, hardened alloy gear train, and fully ground alloy steel spindle mounted on pre-loaded precision ball bearings requiring no adjustment. Standard table 40" x 9" overall, with larger table optional, is supported by 18" of saddle bearing, and has accurately ground lead screws for transverse and longitudinal movement. Constant flow coolant system of 8 gallon capacity starts and stops with spindle.

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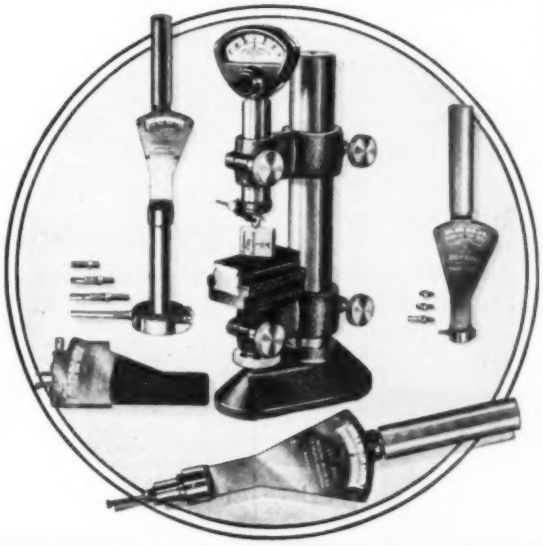

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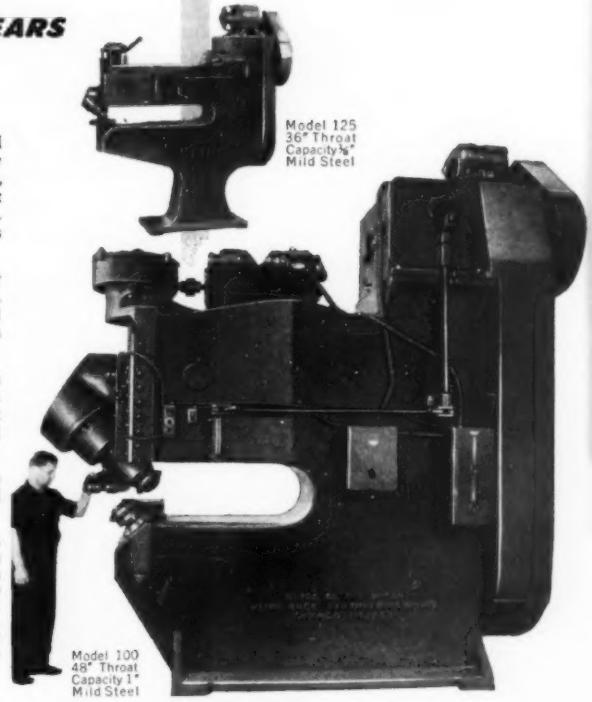

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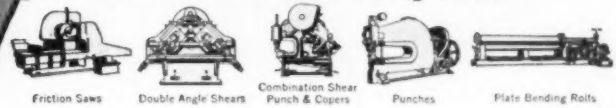
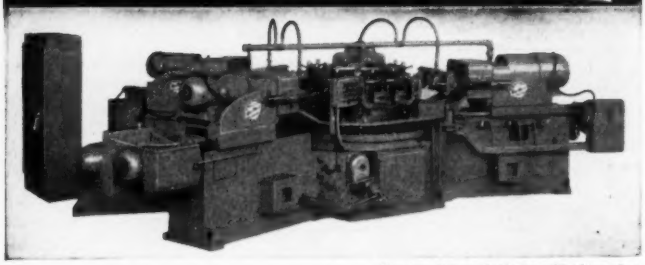


Drilling and Reaming

388 KING PIN HOLES PER HOUR



Station Type Indexing Machine for drilling and reaming king pin holes.

On a Davis & Thompson 5 Station Machine

This type MDT FIVE STATION INDEXING DRILLER has five fixtures mounted on the index table. Each of these fixtures holds 2 RH and 2 LH automobile front suspension support arms. Four ROTO-MATIC Power Heads, each having four spindles, perform the following operations:

1. Drill 53/64" dia.—Half way through.
2. Drill .823" dia. — Balance of way through.
3. End Cut Ream .8547/.8550" — Full length of hole.
4. Finish Ream .8635/.8637"—Full length of hole.
5. Load and Unload.

Two RH and two LH pieces are completed at the end of each cycle. Cycling is automatic, and, operator loads and unloads during machine cycle.

4 New Davis & Thompson Mechanical Power Heads

Included in the design of this machine are the new ROTO-MATIC Mechanical Electrical Power Heads operated through screw feed. An important safety feature of these units is the patented overload release clutches on the feed. Because of the simplicity of their design the units require a minimum of servicing.

Free Data

Will be furnished on request.

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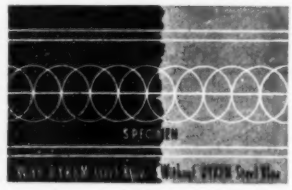

Simply brush on right at the bench: ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

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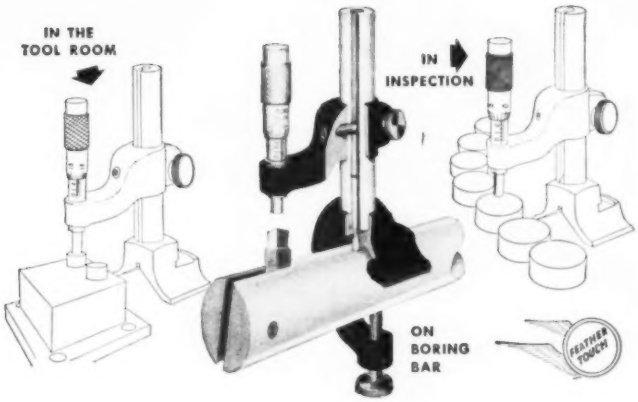

This convenient Post Gage can be set up anywhere in 3 minutes or less. It is instantly adjustable from 0 to 4", for setting cutting tools in boring bars, or for measuring from any surface plate. Set-up is made by inserting setting standards in the hollow post. Pictures above show ingeniously designed base, which permits use of clamps in three sizes for securing the base on boring bars up to 5". The post will swing so that measurement can be taken on either side of the base without changing the measurement reading or the clamped position. This gage takes the guess work out of tool setting and readily adapts itself to many other tool room and inspection functions.

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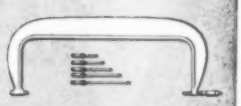

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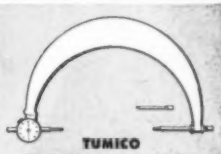

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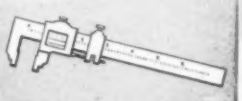

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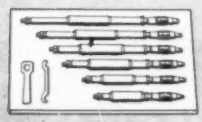

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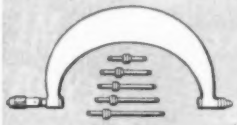

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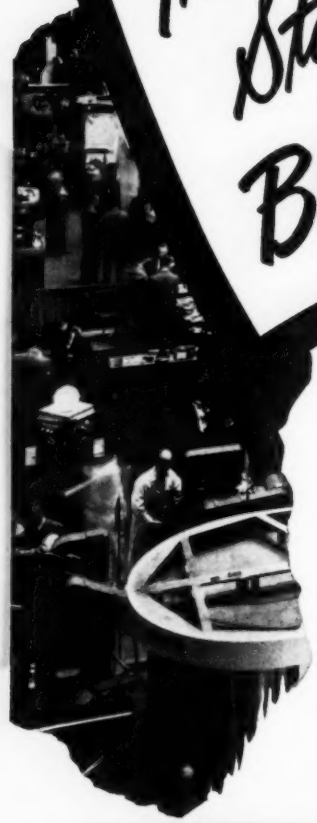

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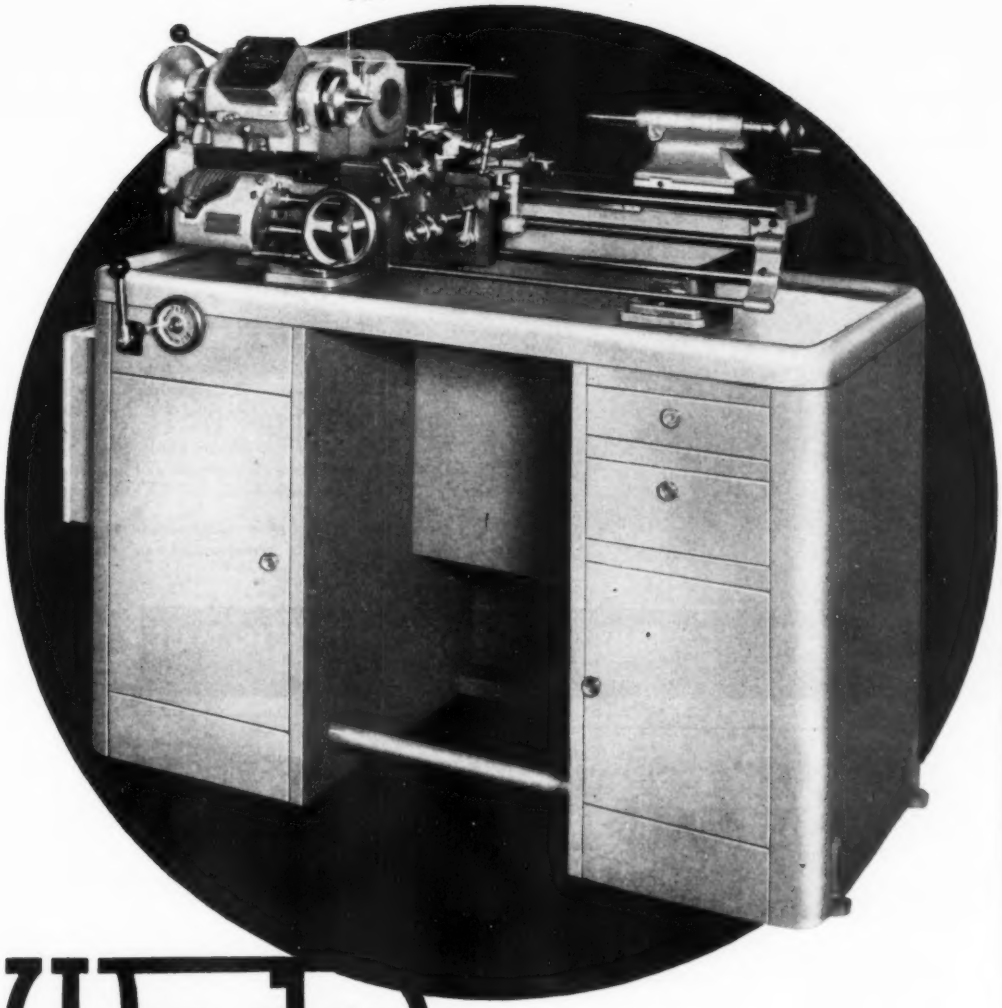

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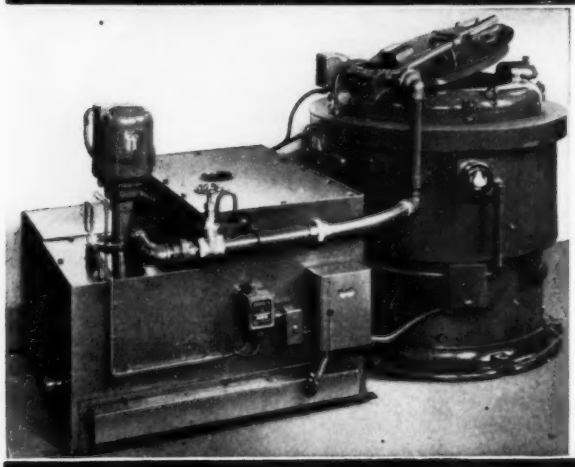

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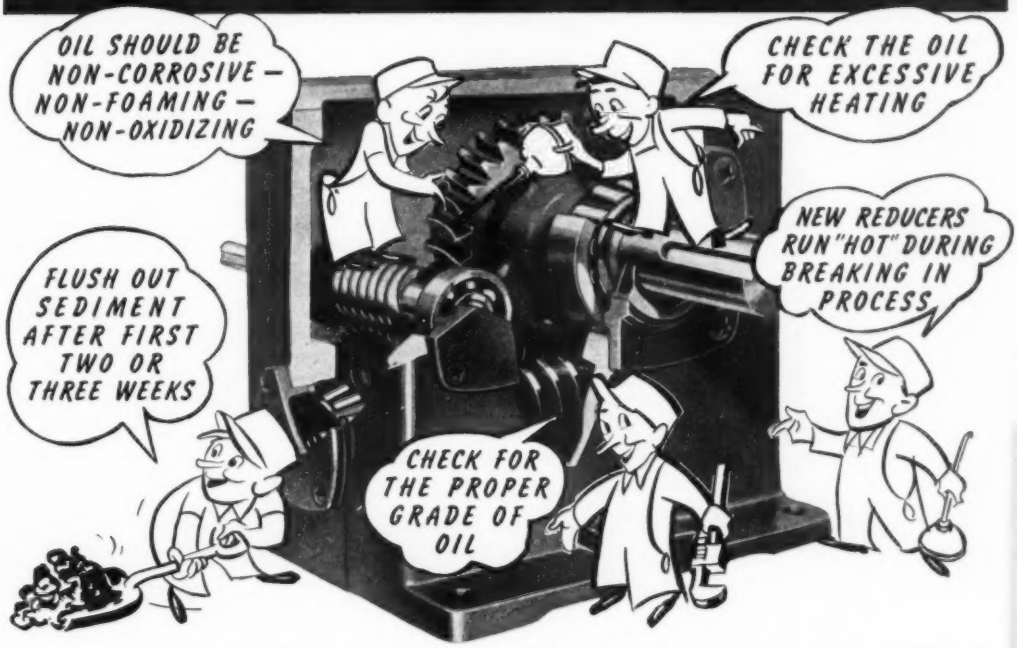
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FLUSH OUT SEDIMENT AFTER FIRST TWO OR THREE WEEKS
CHECK FOR THE PROPER GRADE OF OIL

Ohio Speed Reducers, correctly installed and lubricated require practically no attention. There is no constant supervision and adjusting. The housing interior of Ohio Speed Reducers is so designed to direct proper lubrication back to the bearing. Only an occasional replacement of lubricating oil is necessary. It is generally agreed among power transmission authorities that the most satisfactory lubrication of speed reducers is obtained through the use of high grade petroleum oils; as temperatures sometime become extremely high, the oils should retain their body and lubricating qualities under heat. If the unit is operated in extremely low temperatures, the oil should have a pour test lower than the lowest surrounding temperature.

Ohio Speed Reducers are filled at the factory with the proper oil to the correct level. After a few weeks of operation, the unit should be drained and flushed and old oil should be replaced or filtered to free solid particles caused by wearing in process. Oil should be changed every six or eight months under normal operating conditions, to prevent accumulation of sludge.

Do not have too much oil in housing; violent agitation of the viscous oil generates considerable heat, tending to destroy the lubricating qualities of the oil. If the reducer shows signs of excessive heating, check the oil level which should be neither too high nor too low.

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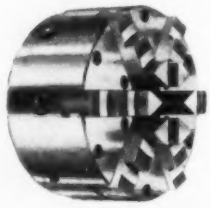

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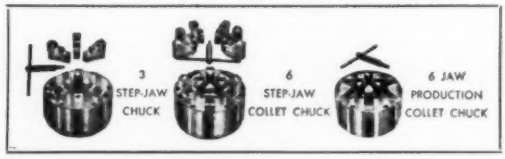

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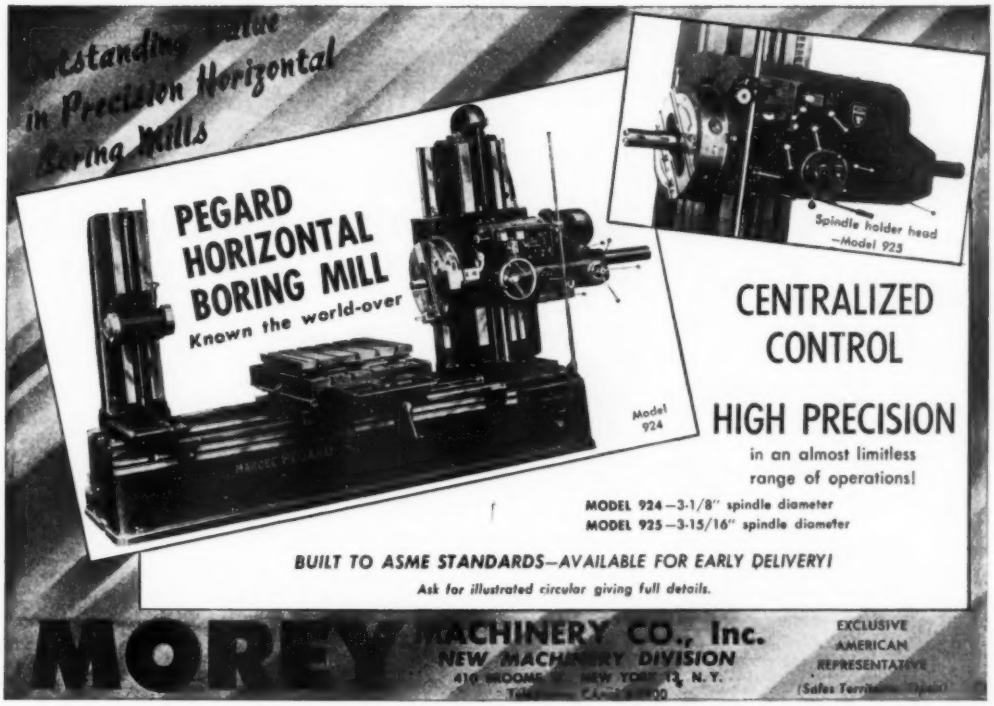
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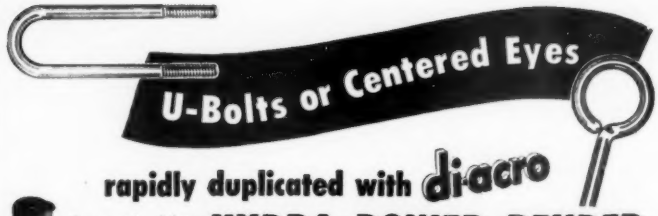

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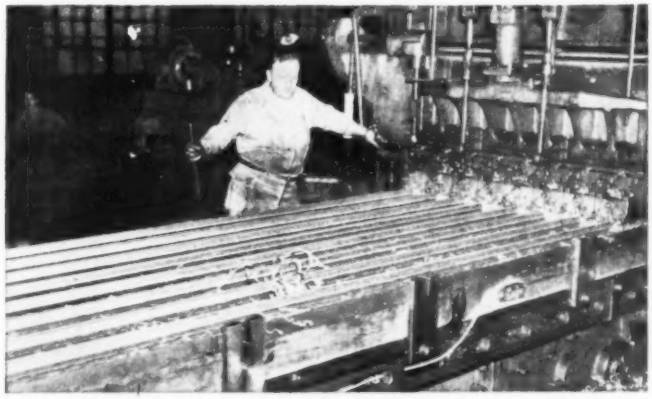

The problem: Hold guide rails 8′ to 16′ long with small cross section; planed in units of eight, three tool bits per rail. Chuck must hold against twenty-four cutting edges, 90 sfpm, feed 0.060″. Close tolerance and finish necessary—tool bits and work pieces cannot be magnetized.

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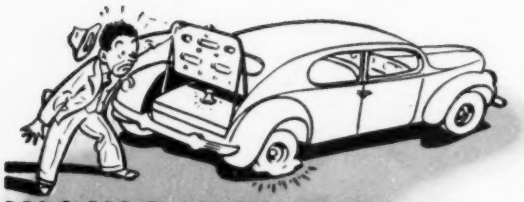

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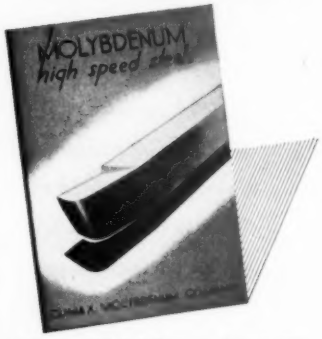

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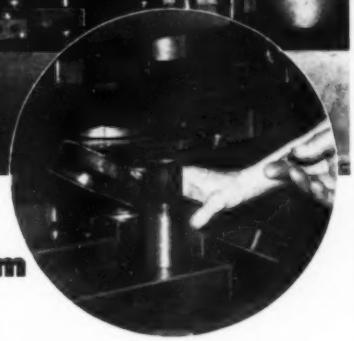

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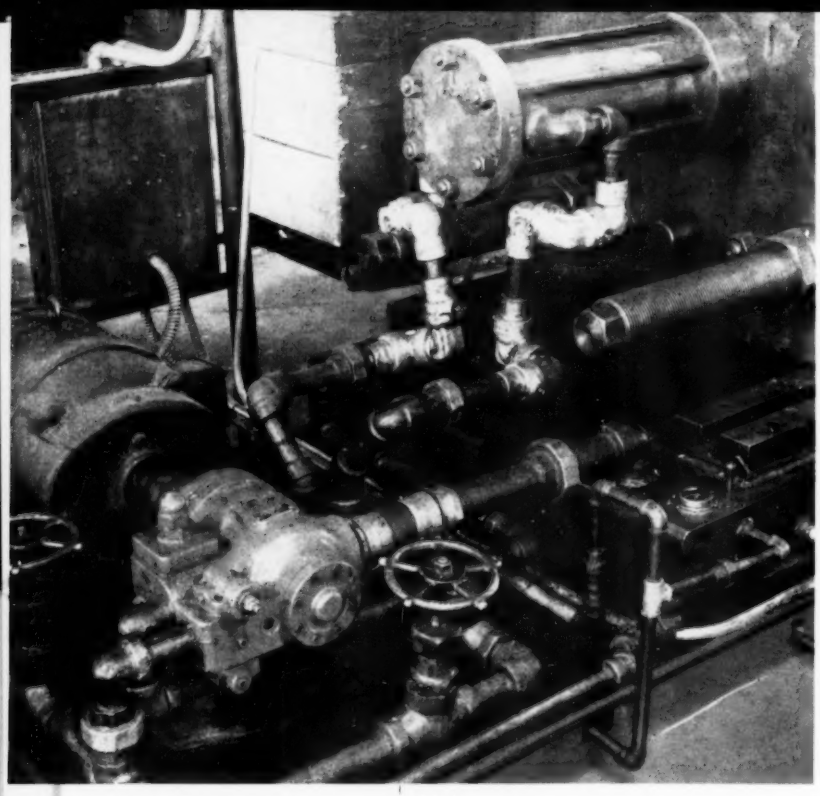

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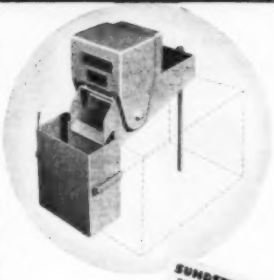

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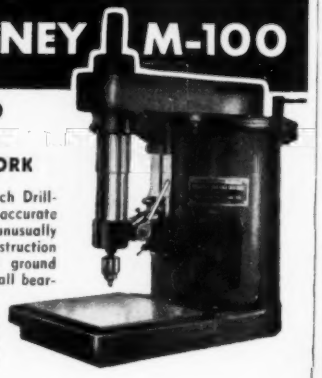

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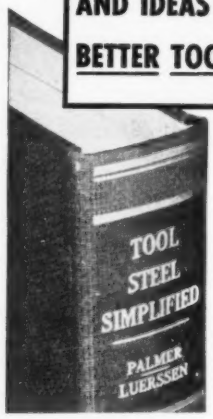

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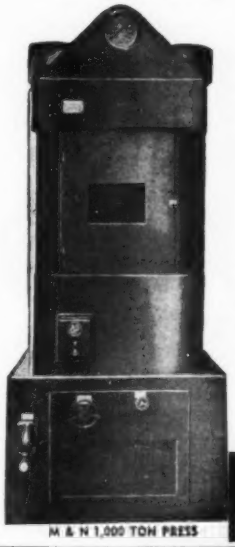
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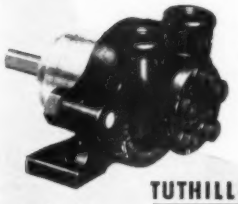

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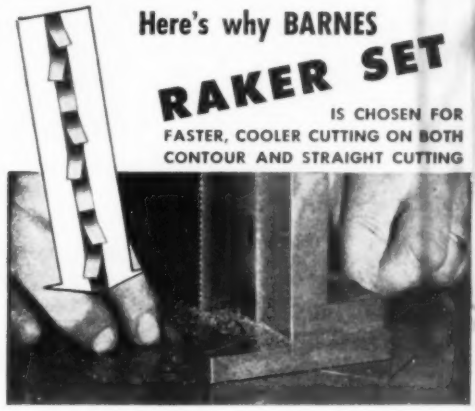

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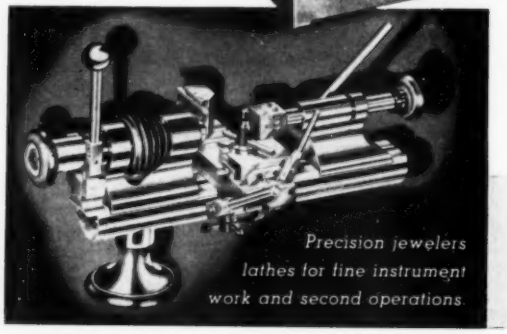

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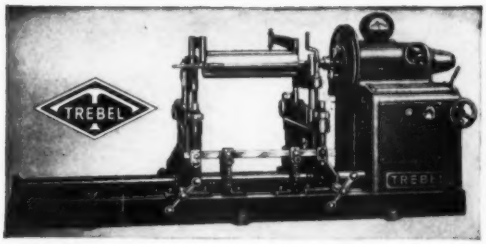

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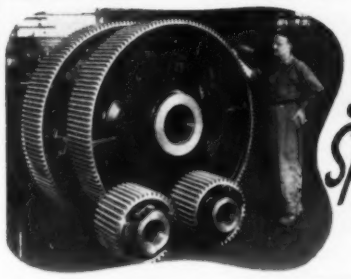

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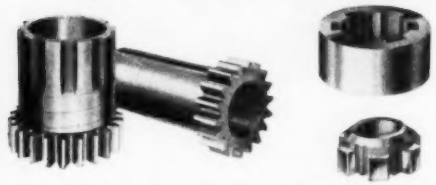

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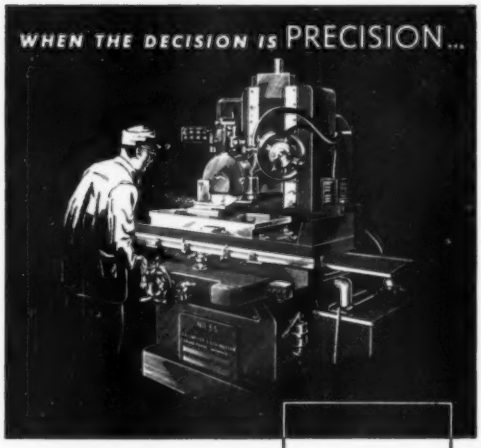

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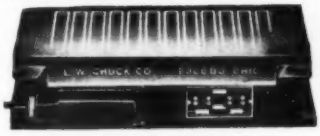

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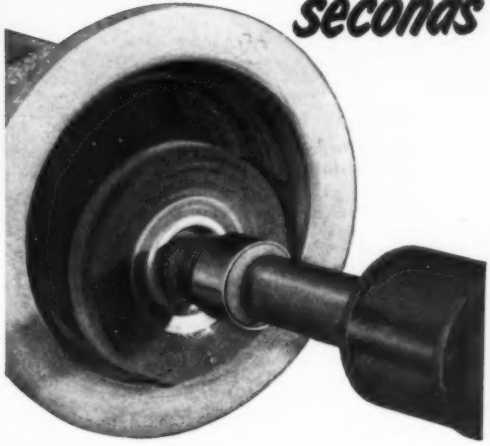

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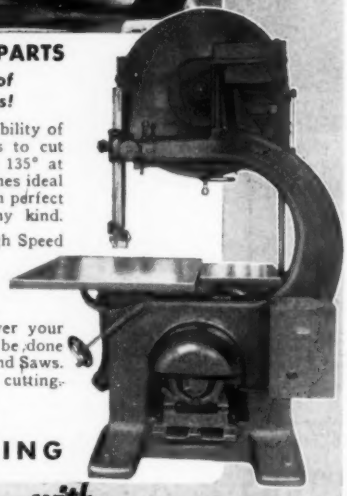

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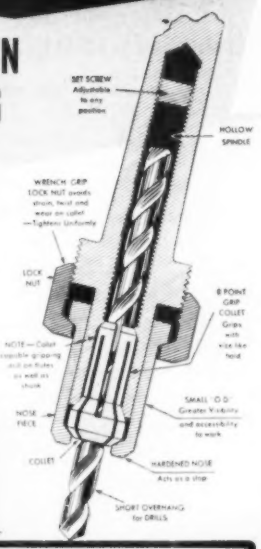
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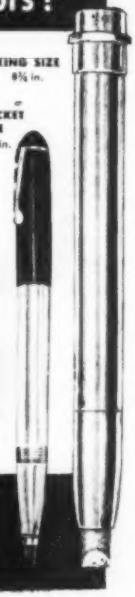

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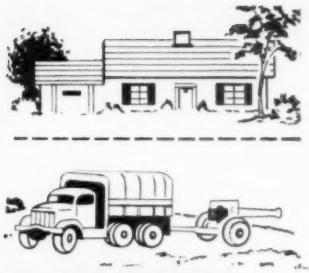

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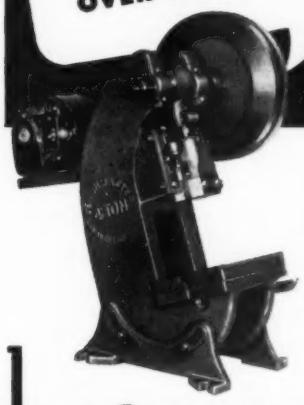

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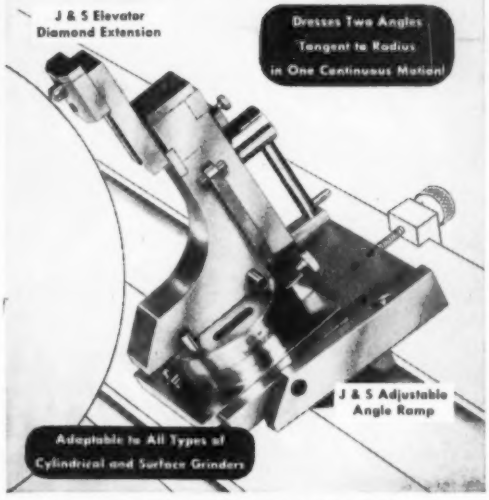
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Photo shows how the standard J & S Model "E" Dresser is applied to cylindrical grinder with inclined table, wheel over 14" dia. Two standard J & S attachments (shown above) easily adapt dressers to all grinders. Also, by inverting diamond extension, you can dress 1/4" dia. mounted wheels for internal grinding.

You can easily increase production rates of your grinding machines by reducing time-off for form-dressing. For **fastest possible** dressing, J & S "Fluidmotion" Dressers are the answer. With "Fluidmotion", only **one setting** is necessary for **dressing two angles tangent to a radius—using one handle in one continuous motion.**

Resulting forms are clean, precise—angles and radii flow into each other. On high production set-ups, sharp contours **without tool or chatter marks** are consistent to .0001" accuracy.

With today's tight supply of experienced machinists—and ever-increasing demand for faster production—it will pay you to investigate J & S "Fluidmotion" Dressers. They are the simplest, fastest dressers you can buy—**even beginners can use them** to boost production rates of your cylindrical and surface grinders. Write for DRESSER CATALOG.

*Reg. U.S. Pat. Off.

J & S "Fluidmotion" Dressers are one of the popular J & S "Machine Shop TIME SAVERS". ("Time Saver" booklet, describing J & S "Fluidmotion" Wheel Dressers, etc., sent on request.)

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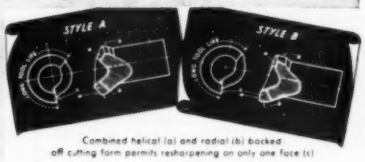

Combined helical (a) and radial (b) backed off cutting form permits resharpening on only one face (c)

STYLE B
for bottoming and facing

STYLE C
for internal threading

Design is based on a *mathematical formula* which guarantees correct cutting and clearance angles anywhere around the periphery of cutting head—maintained uniformly within limits of a few minutes of 1°.

Bokum tools are available in 3 cutting materials: (2) carbide tipped, Cat. K-398; (3) solid carbide, Cat. K-948.

In range of sizes to bore holes from 1/16" dia. up.

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BE suspicious of any figures you hear, and of most of those you see. If they don't correspond immediately to your previous experience, check 'em before you quote or use 'em. The urge to make numbers bigger, or smaller than anything previously reported is overpowering to some people; don't be victimized.

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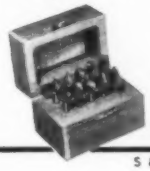

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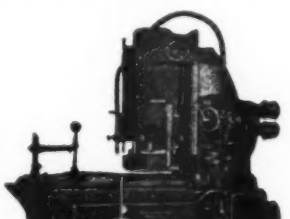

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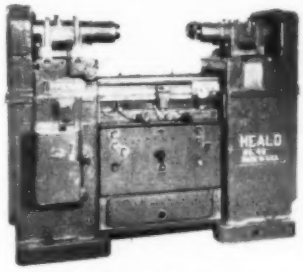

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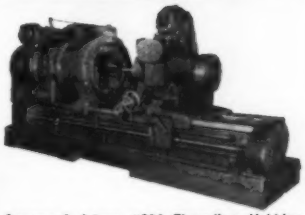
MILL, 2A Brown & Sharpe Horiz. Univ.
MILL, #4B Brown & Sharpe H.D., Horiz.



Sommer & Adams #20A Threading, Hobbing & Boring Machine, swings 36", 42" centers, 18" cross feed, last use threading breech blocks on 105 MM guns.

MILL, #14 Garvin Plain Horiz.
MILL, #0Y Brown & Sharpe Plain Horiz.
MILL, Bridgeport Model #BH, M.D.
MILL, Van Norman M.D. Hand Mill, late.
MOTOR GENERATOR SET, 100 KW Gen. Elec.
MILL, Cinc. Horiz. #2, #3, #4, #5, High Power.
MILL, Cinc. Vert. #2 #3, #4, High Power.
MILL, Cinc. 18" Mfg. Type with Vert. head.
MILL, #14 Cochrane-Bly Vert. Duplex Univ. Shaper
MULT-MILLER, U.S. Tool #MM-1-6, Auto. Prod.
MILL, #30H Sundstrand Two Spindle Hyd.
MILL, #1-M Kent-Owens M.D. Plain Horiz.
MILL, PLANER, Ingersoll 42x36x12, 4 heads.
MILLING MACHINE, Kempsmith #3, Horiz. Univ.
MILLING MACHINE, LeBlond #4 Horiz. Univ.
MILLING, Brown & Sharpe #1½ Horiz. Univ.
MILLING, MACHINE, Kempsmith #2 Horiz. Univ.
MILLING, Brown & Sharpe #2 Horiz. Univ.
MILLING MACHINE, Van Norman #2 Duplex.
MILLING MACHINE, K & T #2B, Horiz.
NIBBLER, #2 Savage Roller Die ¾"x36" cap.
NIBBLER, Grav Turret Type 1½"x24" cap.
THREADING, Staybolt Lassiter Millholland 1½"
THREAD MILLER, Hanson Whitney 4"x9" Univ.
THREAD MILLER, Lees Bradner #40A Automatic
THREAD MILLER, Plan-O-Mill #3 Planetary Form & Thread Semi-Automatic Milling Machine.
PAPER SHREDDER, #10 Mitts & Merrill, M.D.
PLANER, Grav 30"x30"x10' A.C. Motor Dr.
TAPPER, W & S #1 Sole. Spdle.
POWER PRESS, Bliss #164 Open Back.
POWER PRESS, Bliss #3A R.R. Dble. Crank Grd. 45 tons, 4" stroke, 36"x24" Bed Area.
POWER PRESS — Bliss - Consolidated #163 - B Straight Side Dble. Crank, 45 tons.
PRESS, V & O #4 O.B.I. 38 tons.
PRESS, Robinson #5 O.B.I. 85 tons.
PRESS, Federal #2 O.B.I. Grd. 2" Stro.
PRESS, Bliss #18, #19, #20, #21, OBI, A.C., M.D.
PRESS Toledo 59½ S.S. 440 ton cap. 8" str.
PRESS Waterbury-Farrell High Speed 60 tons #3W.
PRESS, 60C Bliss Double Action, 3 crank.
WHEEL PRESS, Caldwell 200 tons cap. Hyd.
PRESS, Lucas 15 tons Power Arbor M.D.
PRESS, #68 Whitney Deep Thr. 24", foot.
PRESS, P2, P3 Ferracute M.D. Roll feed
PANTOGRAPH, #1A Gorton M.D. Engraving.
PUNCH, Hacker Turret, 8 station, cap. 2¼" hole.
PUNCH, H & J #2 Sgle. End, 24" Thr. 1" thru 1".
PUNCH, H&J #5 Sgle end, 48" Thr. 2" thru 1½".
RIVET SETTER, ¾" cap. Penn. Tubular Rivet.
ROLLS, #1 Buffalo Forge Wrapping.
COLD SAW, Espen-Lucas #700, 48" dia. blade
CUT-OFF SAW, Yates-American #M-90.
SAW, #302 Campbell Abrasive Cut-off.
SAW, #28-C Racine Shear Cut 6"x6" cap.
SAW, NS18-10 Grob Band & Butt Welder.
SAW, Band, Tannewitz #GH-36" High Speed
SHAPER, 16" American B.G. Motor drive.
SHAPER, 32" Cinc. B.G., Motor driven.
SHAPER, Columbia 32" B.G. Crank.
SHAPER, Morton 36" Draw-Cut, 4-Speed.
SHAPER, G & E 24", high duty, back geared, M.D.
SHEAR, Quickwork #A-1 Rotary 60" Throat, 18 ga.
SPRUE CUTTER, Milwaukee 56 tons, 2½" cap.
SCRAPER & SPOTTER, Anderson Bros., M.D.
SURFACE PLATES & TABLES, all sizes.
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WELDER, 75 KVA Federal, M.D., Spot
WIRE STITCHER, Morrison and Acme, M.D.

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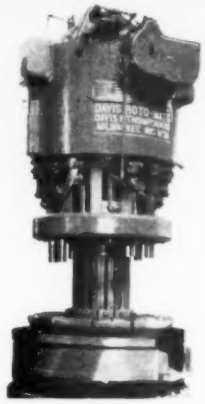

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OTHER MILLERS IN STOCK

3 SPINDLE LELAND GIFFORD, Hydraulic Feed, #2 Morse Taper, overhang 7½"

4 SPINDLE AVEY W/Hydraulic Unit, #2 Morse Tapers, serial #16407

#210 BARNES, #4 Morse Taper, Overhang 10¾", 5 H.P. 220/440 volt

#216 BAKER Heavy Duty #5 Morse Taper, Capacity in steel 1½", speeds 76-541 RPM

#217 BAKER, #4 Morse Taper, Capacity 2", swing 24½", table 17"x23"
H-3 BARNES HYDRAM

IMMEDIATE DELIVERY
HARD TO FIND MACHINE TOOLS

#1FU Foster Fastermatic Automatics, late, serials 164 and 174, quantity of extra tooling (2)

#00, #0, and #2 Brown & Sharpe Automatic Screw Machines and Turner Drives.

4½" Cleveland Model A Automatic Screw Machine, serial #34486.

3A Warner & Swasey Saddle Type Turret Lathe, M.D.

36-90 Cincinnati Hydromatic Duplex Milling Machine, serial #3B38D1L-1, late.

#0-8 Cincinnati Vertical Mill, late.

#10 Brown & Sharpe Plain Production Mill, late.

#3VG Reed Prentice Vertical Mill, late.

#14 Cochran-Bly Universal Mill Shaper.

6" Pratt & Whitney Slotter, M.D.

#2 LaSalle Hydraulic Surface Grinder, late.

#2 Cincinnati Centerless Grinder, M.D.

10"x18" Landis Cylindrical Grinder, late.

Baush Radial Drill and Tapping Machine, late.

2—#1 LMS Leland Gifford Hydraulic Drill Presses, late.

#2 Manville Four Slide Wire Forming Machine.

Two Bushel Barrett Oil Separator, late.

3" Gleason Bevel Gear Generator, late.

DPC-1 Jones & Lamson Pedestal Optical Comparator.

50 Ton Henry & Wright Dieing Machine, Reeves drive.

Agents for Cincinnati Lathes and Canedy-Otto Drill Presses

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BORING MILLS—Horizontal
FRANKLIN 4¾" Bar; table type; M.D.
LANDIS #40, 4" Bar; floor type; M.D.
LANDIS No. 35 3½" floor type; Bar
NILES 8" bar floor type, motor drive

BORING MILLS—Vertical
BULLARD 16" 6-spindle "A" Mult-au-matic;
NILES 36-44" side head; M.D. Late
NILES-BEMENT-POND 144"; hvy M.D.

BROACHES
CINCINNATI 1-30 Duplex Vert. Hydr.
LaPOINTE #2L M.D. Late

CRANES
MILWAUKEE 5-ton; spans, 22'2"; 24'; 25'; 36'11"; 37'2"
MILWAUKEE 10-ton; span, 36'
MILWAUKEE 25-ton; span, 84'4"

DRILLS—Miscellaneous
BARNES No. 420 Deep Hole; late
BARNES H-3 Hydram; hydr.; Inverted; late
BARNES H-2 Hydram; hydr.; M.D.
BARNES 20" 4-spindle; Camel Back; Late
BARNES 24" all geared; Camel Back; M.D.
BAUSH 1¼x30" Deep Hole; Late
EDLUND 2B, 3-spindle; 1⅝" Dia.
MOLINE 6-spindle Multiple Hole-Hog; 3⅝" dia.; M.D.
NATCO No. 14 Mult.; Rect. Hd.; PRT; M.D.
NATCO D-5 Multiple; adjustable; Late
BODINE #42-20 multi-univ., dial feed; M.D.

RADIAL DRILLS
CARLTON 6'17" plain; M.D.
DRESES 5'15" Universal; M.D.

GEAR CUTTING EQUIPMENT
BROWN & SHARPE #18 Spur Bevel Cutter
BROWN & SHARPE 6-72" Auto. Cutter; M.D.
CROSS No. 1 Tooth Rounder; M.D.
FELLOWS Nos. 61A, 6Z2, 71S, 7S, 7, 7A, 7S, 72, 77 High Speed Gear Shapers; late
FELLOWS 8-M Red-Liner; M.D.; Late
FELLOWS 12-M Involute Meas. Instr.; Late
FELLOWS 15-LS Lapper; late
GLEASON 3" & 12" Straight Bevel Gen.; late
GLEASON 10", 11" & 18" Bevel Gear Gen.
GLEASON 24", 37", 77", 96" Bevel Gear Planers; M.D.
GLEASON No. 14 Hypoid Grinder; late
PRATT & WHITNEY 10" Gear Grinder; late
SYKES #4A gear generator; M.D.
SYKES #8A gear generator; M.D.

GEAR HOBBERS
BARBER COLMAN #12 dble. overarm; M.D.
GOULD & EBERHARDT #24H. Late
GOULD & EBERHARDT #36BM 3 spindle Auto. Rougher; M.D.
KOEFFER WM-11 Auto.; bench type; Late

GRINDERS—Plain Cyl. & Univ.
CINCINNATI 14x48" Univ.; late
LANDIS 4x18 type H; M.D.; late
LANDIS 4x18" Type H. Latest
LANDIS 6x18" Type C Plain; Hydr.; late
LANDIS 10x18" type C plain Hydr. M.D.
LANDIS 10x24" Univ.; late
LANDIS 10x24; plain motor drive
LANDIS 29"x130" centers Plain; M.D.

MONARCH 22"x456" centers Model CM Precision Engine Lathe; Helical geared; TIMKEN bearing; M.D.

NORTON 6x30 plain; motor drive
NORTON 10x72" type C Plain; Late
NORTON 17x42" centers crankpin; Hydr. Dble. hd.; M.D.

GRINDERS—Miscellaneous
BRYANT No. 3, 5, 5A, 16-C16, 16-CP-16, 24-36" Internal hydr.; Late
GLEASON No. 12 Tool Sharpener; late
HEALD No. 22 rotary surface; M.D.
HEALD No. 81 "Sizematic"; Late
HEALD No. 72-A-5 "Gagematic" Int.; Late
HEALD No. 72-A-3 "Gagematic" Int.; Late
LEMPCO 22x72" Mod. KG Crankshaft; Late
PRATT & WHITNEY B 14x36" Hydr.
SHEFFIELD Micro-Form Grinder; late
VAN NORMAN 666 Crankshaft Regrind
VAN NORMAN 63B Onc. type Radius; Late

LATHES ENGINE & MFG.
AMERICAN 24"x220" centers; Timken; Late
AMERICAN 36"x360" centers; 2 carriages
AMERICAN 56"x33' centers geared; heavy
HARDINGE T.R.59 Bench type; Late
JONES & LAMSON "FAY" 20x25" Automatic; M.D.; Late
LEHMANN 25x96" entr; TIMKEN; grd M.D.
LeBLOND 16x36" cent.; Auto.; Timken; late
LeBLOND Mod. 7ACL Crankshaft; M.D.
LODGE & SHIPLEY 24x120" centers, Late
LODGE & SHIPLEY No. 5—24" and 96" centers DUOMATIC; Timken; Late
LeSWING 4x60", 8x24", 8x108"; late
MONARCH 22x456", 3 carr. CM TIMKEN
MONARCH 14x42" centers "Z" Magnamatic Auto.; TIMKEN; M.D.; Late
NILES 30"x50' Boring "Time-Saver"; Timken; Late
NILES 48"x32' centers Engine; geared; M.D.
REED PRENTICE 16"x24" centers grd; M.D.
SPRINGFIELD 14"x43", geared; M.D.

LATHES—TURRET
GISHOLT No. 3, 4, 5 Ram; TIMKEN; Late
MOREY No. 2, 3 ram type TIMKEN
J & L No. 8A; Late

MILLING MACHINES—Plain
BROWN & SHARPE #12, Late
CINCINNATI 0-8; M.D.; Late
CINCINNATI 4-48, 4 spindle, Tracer; Late
CINCINNATI # 24 Duplex; BPD
GOULD & EBERHARDT 25 Cont. type; M.D.
CINCINNATI No. 4 High Power; TIMKEN; Rect. M.D.
HERO #4P. New
SUNDSTRAND No. 3 Rigidmill; TIMKEN Late
TEGARD #1 Plain. New

MILLING MACHINES—MFG.
HALL Style C & D Planetary; Late
INGERSOLL 32x24x16' Planer Type; 2 hds
INGERSOLL 30x24x12' Adj. Rail Slab; M.D.
INGERSOLL 42"x42"x18", 4 heads, Planer Type, Late
LEES BRADNER 14x54" HT Thread. Late
SUNDSTRAND Mod 3A Duplex 42" feed M.D.
TAYLOR & FEN M-80 Duplex Spline; Late

MILLING MACHINES—Vertical
CINCINNATI 0-8 Mod EA Automatic PRT; M.D.; Late

MILLING MACHINES—Thread
LEES BRADNER HT 12"x36" M.D. Late
LEES BRADNER HT 12"x50" M.D.; Late
MOREY 12x30", 12x60" centers; late
PRATT & WHITNEY 4½x12 Mod. C; late
PRATT & WHITNEY 6x132; M.D.

PLANERS
B E T T S CONSOLIDATED 84" x 92" x 16' 4 heads PRT Box Table; DC Reversing M.D.
B E T T S (CONSOLIDATED) 108" x 84" x 44' 4 heads; PRT; Box Table; M.D.
CLEVELAND 48" x 48" x 12' Openside; AC; M.D.
DETRICK & HARVEY 48"x48"x16' hydr.
LIBERTY 48"x48"x16' 4 hds. Double housing; vari-voltage
LIBERTY 72"x48"x20' 4 heads; Convertible openside vari-voltage drive; late
NILES 108"x84"x42' 4 heads; Rapid Traverse; Box Table DC; M.D.
NILES-BEMENT-POND 72"x72"x30' 4 hds.; Rapid Traverse; M.D.
SELLERS 60"x60"x12' 4 heads vari-voltage dr.; PRT
WOODWARD & POWELL 54"x54"20'; 4 heads; M.D.

SAWS
ESPEN LUCAS No. 670-30' cap Hydr.; Late
HELLER Model SS-1, 6¾" Cap Cold Saw

SHAPERS—SLOTTERS
CINCINNATI 16", Heavy; PRT; Late
LeMAIRE 18" Vertical Hydraulic; Late
PRATT & WHITNEY 6" Vertical; M.D.
GOULD & EBERHARDT 32" "Invincible"; LYND FARQUHAR 26" Openside; M.D.
NEWTON 16" Slotter; M.D.
ROCKFORD 20" Vert.; Late

PRESSES
BESCO Mod. 21 Inol. 40 ton, 3" stroke NEW
BIRDSBORO 325 ton Vert Hydr; Late
BLISS No. 410A Toggle Drawing; tie rod; steel gearing
CHAMBERSBURG Horiz. Straightening; 24" str.; M.D.
BLISS No. 3½A geared toggle; dble. acting
GLEASON 15", 25" Quenching; hydr.; M.D.
NIAGARA No. 512 DG tie rod; 262 tons; M.D.
UNITED ENG. 500 ton hydr. forging
WATERBURY Farrel 125 Ton; St. Side

MISCELLANEOUS
ACME 2" forging, upsetting; late
AJAX 3½" forging, upsetting; M.D.
BAKEWELL No. 1, 1R Precision Tapper
BAKER #5 Keyseater; motor drive
BARNES No. 172, 214 Honing; hydr.; Late
DeLAVAL No. 194 Coolant Clarifier; Late
FISCHER No. 1, No. 2 Oil Groover; Late
FOSTER 4x36" centers; Superfinisher; Late
GROB GS-20 Metal Band Saw—Filer; M.D.
GROB NS-24 Band Saw; M.D.; Late
LANDIS 2" agle. Dble. Spdle. Threaders; M.D.
MANVILLE 2C Auto Screw Slotter; M.D.
MANVILLE No. 2 Slotters; Late
MANVILLE No. 3 Trimmers; Late
MANVILLE No. 2 DSOD Readher; M.D.
MANVILLE 1A DSSD Heater; M.D.
MANVILLE No. 3 Rehanders; Late
MANVILLE No. 3C Thread Roller; M.D.
WATERBURY FARREL No. 11 Thread Roller; M.D.
LeBLOND #2 Barrel Lapper; M.D.; Late
US TOOL 810-B Cutter Reliever; Late
NORTON 2F, 26F Lapping Machines; Late

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No. 1 Minster Hi Duty, m.d., tapper
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No. 7, 7A Fellows, m.d.
No. 18 Fellows Gear Finishing Machine, m.d.
No. 61 Fellows, belted m.d.
No. 61A Fellows, m.d., latest type
No. 64B Fellows, m.d.
No. 615A Fellows, m.d., late type
No. 64A Fellows, m.d., latest
No. 645 Fellows, belt
No. 72 Fellows, m.d., latest
No. 75 Fellows, m.d.

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6x20" Fitchburg Hydraulic Spline & Gear Grinder, m.d.
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10" Pratt & Whitney Hydraulic Spur & Helical
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No. 13LS Fellows Gear Lapper, m.d.
SG11 Gear Grinding Machine, m.d., latest

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No. 12 Barber-Colman, single overarm, m.d.
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No. 12H Gould & Eberhardt Universal, m.d.
No. 3A Brown & Sharpe, m.d.
No. 44 Brown & Sharpe, Spur & Spiral, m.d.

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Gleason Spiral Bevel Gear Roughor, m.d.
3" Gleason Straight Bevel, m.d.
8" Gleason Straight Bevel, m.d.
11" Gleason Straight Bevel, m.d.
Cincinnati Gear Burnisher, m.d.
Cross Gear Tooth Rounder, m.d., 9" cap.
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Gleason Gear Tester for hypoid gears
No. 1 Brown & Sharpe Spur Gear Tester
12" Cap. National Broach & Machine Co.
18" National Broach & Machine Co.

CENTERLESS GRINDERS

No. 2 Cincinnati, m.d.
Cincinnati Valve Seat Grinder, cap. 1/2" valve stems, m.d.

CYLINDER GRINDERS

No. 50 Heald Cylinder Grinder, Hydraulic, m.d., 11-18" spindles
No. 55 Heald, m.d., 15-24" spindles
No. 73 Heald Airplane Cylinder Grinders, brand new, m.d., late type

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6x18" Landis Plain Self-Contained, m.d.
6x18" Landis Type C Hydraulic, m.d., late
7x11" Leach External Grinder, s.p.f.
6x30" Cincinnati Hydraulic, m.d.
8x18" Cincinnati Saddle Type, m.d.
8x36" Cincinnati Saddle Type, m.d.
No. 10 Brown & Sharpe Self-Contained, m.d.
No. 11 Brown & Sharpe Self-Contained, m.d.
10x18" Landis Type C, m.d.
10x24" Landis, m.d.
10x36" Cincinnati Hydraulic, m.d.
10x48" Brown & Sharpe, belt
10x72" Brown & Sharpe, belt
10x72" Landis, m.d.
10x72" Norton, motorized
12x36" Landis, m.d.
12x48" Cincinnati Plain Self-Contained, m.d.
12x48" Cincinnati, with spline grinding attachment
12x48" Modern, belted m.d.
12x96" Landis, m.d.
14x18" Cincinnati Plain Self-Contained, m.d.
14x48" Cincinnati Plain Self-Contained, m.d.
14x50" Norton, motorized
14x52" Norton, motorized
16x48" Landis Type D, m.d., latest
20x120" Landis Self-Contained, m.d.

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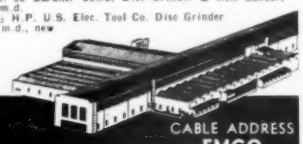
No. 151 Besly, m.d.
Hammond Disc Grinder, Model No. 600
Model V10 Hammond Belt Sander, m.d.
No. 4 Gardner Disc Grinder, m.d.
No. 5 Gardner Disc Grinder, Double End, m.d.
No. 20 Gardner Comb. Disc Grinder & Roll Sander, m.d.
7½ H.P. U.S. Elec. Tool Co. Disc Grinder m.d., new



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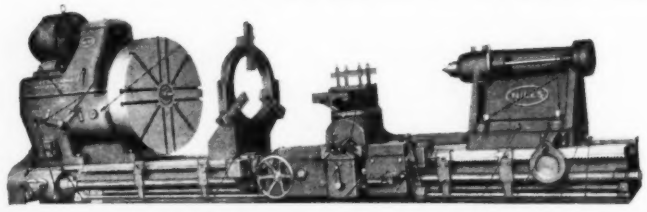

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Bullard 24", VTL New Era
Cleveland 2½" Bar Cap.
Giddings & Lewis No. 0, 3" cap.
Giddings & Lewis No. 32, 3⅜" cap.
King 42", 72" Vert. 2 rail heads
Niles-Bement-Pond 4" Bar
Niles-Bement-Pond 4½" Bar
Niles-Bement-Pond 60" Vert.

DRILLS AND RADIALS

Bausch Multi-spindle
Bausch Radial Drill & Tapper
American 6'x15" Univ.
Buffalo #2 Motor Spindle
Cincinnati Bickford 6'x13" col.
Foote-Burt #25
Walker-Turner Radial 2½'
Leland Gifford 2LMS (2)
Natco Multi-spindle

ENGRAVERS

Auto Engravers Bench Type
Deckel Type 3 GK2 Dimensional, New
Gorton #1A, ID, ME
Gorton #3B 3 Dimensional

GEAR EQUIPMENT

Barber-Colman #3, #2
Barber-Colman #12 Hobber (2)
Fellows High Speed Shapers 712, 72, 725, 71
Flather 72" Cutter
Gleason 3" Straight Bevel Generator
Gleason #4 Angular Bevel Tester
Gleason #2 Surface Hardener
Gould & Eberhardt 36" Cutter
National Broach Red Ring Lapper, Shaver
Schuchardt & Shutte #1 Hobber
Fellows #20M Redliner

GRINDERS, MISCELLANEOUS

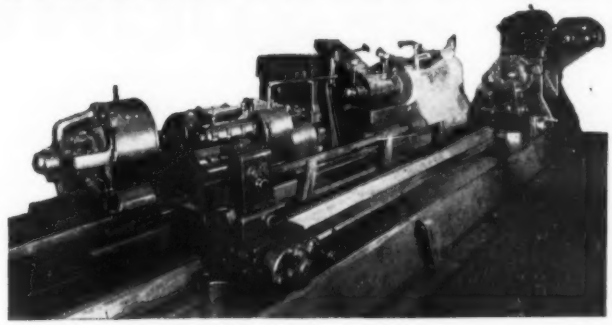
Bryant #5 Internal
Covel #91A Univ. Tool & Cutter
Grenby Int. 1G-12, G2
Heald #73 Internal centerless
Heald #81 Internal Gagematic
Heald 72A3 Int. Centerless Sizematic, #1 Tool
Landis 12"x36" Univ., Latest
Landis 6"x30" Type C Cyl.
Majestic Internal
Norton 6"x30", 10"x18" Type C cyl.
Norton 16"x48" Type C Univ.
Norton Roll Grinder 50"x28'
Oliver #510 Drill Pointer, Sellers 4G
Port Cable Belt WG8
Pratt & Whitney Contour
Pratt & Whitney Radius #R6, K.O. Lee Tool
Van Norman #666 Crankshaft
Vernon Tool & Cutter
Wicaco Internal

GRINDERS, SURFACE

Abrasive 3B 8x24", #33, #34 Vert.
#10 Blanchard 16" Chuck
Blanchard #16, 30" Mag. Chuck
Brown & Sharpe #2 Mag. Chuck
G & L #45 12"x24" Hyd. Feed, #5, 10"x36"
Heald 22—12" chuck, Arter 12"
Norton 6"x18" Hyd.
Pratt & whitney 12x36" Vert.
Reid 11x36 Motor In Base

LATHES

Bertram 28"x22' CC, Late.
Bridgeford 36"x20', 32"x16'.



Norton Roll Grinder 50" x 28' (actual photo)

Lodge & Shipley #3 Duomatics
Hardinge Precision 9", 1" Collet Cap., Rivett
Hendey 12"x42" Geared Head Late, 12"x30", 14"x54"
Hendey 14" Yoke Head Lathes
LeBlond Regal 10"x3' bed
Lipe-Carbo 12"x18" (2)
Monarch 10"x20" EE Lajest
Monarch 12"x30" CKK Late (4), CK.
Putnam 36"x22'
Putnam 42"x17'
Sebastian 12"x4' G.H.
Wickes 32"x35' Geared Head
Reid Small Piece #9WSL
Sundstrand 8x15"
Sundstrand 15" Stub

MILLS, PLAIN, UNIVERSAL & PROD.

Archdale Plain, 14", Prod.
Brown & Sharpe #000, 21
Burke #4 Plain & Univ.
Cinn. 08 Plain
Cinn. 1-12 Mfg.
Cincinnati 1 M Univ.
Kent Owens 1V
Milwaukee #2B, 3B Plain & Univ.
Simmons Micro-Mill
Sundstrand 0.00 Rigidmil
6"x20" P&W Thread Mill
Van Norman #2 Universal

MILLS, VERTICAL

Brown & Sharpe #3 single pulley drive
Cincinnati #4, OS Vert. #2, 3, SPD
Morey #12M Profiler, 2 sp.
Pratt & Whitney Profiler 12B, 2 SP

PRESSES

Bliss 304A 4" Str.
Bliss 645, 650 Hi-Production Presses
Bliss 18, OBI, 58, 62, 162 OB.
Bliss 4½ Double Action, Roll Feeds, Cam (2)
Bliss #78½, 330 Ton, SS, Bliss 74½
Ferracute EG54, 400 Ton Knuckle
Niagara Horning, 15 Ton
Niagara A13¾, O.B.I.
Toledo 400 Ton Knuckle Joint #663
Toledo 29 Double Action Cam
V. & O. #102 O.B.I. Reducing

TURRET LATHES

Acme 6W Fox 2 9/16" Cap.
Bardons & Oliver #2 Late, #3
Brown & Sharpe, #1, 2 Hand, #10, 11
Denver, 6, 2" Shell Turret (3)
Foster #3B 4½" Cap.
Gisholt #4 Bar, Feed, Late, #5, 2L
Hardinge second operation.
Jones & Lamson 2½" Saddle Univ. Late
Morey #2G Late
Oster 601 WD. #2 Simmons Microspeed
Warner & Swasey #1A, 2A
Warner & Swasey G.H. #5 Univ., Late
Warner & Swasey #2, Late

HYDRAULIC EQUIPMENT

SELF CONTAINED PRESSES

500 ton Shaft Straightener 24' Long Bed. Watson Stillman
125 Ton Southwark Press, Bed 96"x30". 30" stroke, 2 to 4 ft. opening
80 Ton Wilson Press, 51"x24" Platen, 11½" St. 13" opening
50 Ton William & White, 20" St. 54"x 20" Bed—24" opening
600 Ton up moving ram 42x60 platen, self-contained

MISCELLANEOUS PRESSES

300 Ton Watson Stillman 24x20" Platen 11" St. 21" opening

***All Hydraulic Equipment** is completely engineered and checked by a competent staff, thus assuring reliability. Send us your Hydraulic problems.*

NEW IN STOCK

Air Hydraulic Presses — Arbor Presses #6C Famco — Band Saws Kalamazoo — Famco 6x12"—Drill Presses all sizes—Hydraulic Press Northern 20 Ton—Injection Molders, 1 ounce—Power Presses, OBI, 1, 4, 4½, 5, 7½, 10, 15, 20, 30 ton —Shaper 7" Amco, 8" Shaperite—Shaper Sheldon 12"—Shears, Foot 22" to 8', 16 & 18 ga.—Shears, Power 3'x18 gauge to 10' x 10 ga.—Welders, Arc, Seam, Spot all sizes—Vert. Milling Attach. Halco H.S. Motors Grinders, Buffers, all sizes.

MISCELLANEOUS

Automatic, Cleveland Model B 1 1/16"
Automatic B & S #00G
Automatic 4 Sp. 1½ Conomatic
Band Saw: DoAll Zephyr 36"
Band Saw: #8 Marvel
Filers—DoAll Band Filer
Filers—Grob Band Filer
Hacksaw: Peerless 6"x6"
Hacksaw: Racine 10x10" Hyd.
Honer: Micromatic #H-1
Keyseater: Davis, Baker, M & M
Shapers: 24" Rockford, 24" Cinci., 28" Gould & Eberhardt. Many Others
Tappers: #1 Bakewell, #3C Haskins
Vertical Shaper: Pratt & Whitney 6" Model "B" 1941
Welder: 50 KVA Eisler Air Operated
Welder: Taylor-Winfield 50 KVA Hi-Wave

This is but a partial listing. Write for free Catalog. Inquiries invited. HUNDREDS OF OTHERS

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HEADLINERS

MILLING MACHINES

No. 3-A Brown & Sharpe Universal, MD
No. 3B Milwaukee Univ., SPD
No. 4-B Brown & Sharpe Heavy Plain, MD
No. 4 Ohio Plain, MD
No. 4 Cincinnati H.P. Vertical, MD
No. 00 Sunstrand Hydraulic Rigidmil, MD, new 1942
48" Cincinnati Plain Automatic, MD
30"x30"x18' Ingersoll Plainer Type Miller, 2 hds., adj. rail

GRINDERS

18"x72" Norton Plain Cylindrical, MD
20"x144" Landis Plain Cylindrical
No. 49-53 Besly Vert. Spindle Disc, motor-on-spindle
14" Pratt & Whitney Model B Vert. Spdle. Surface

LATHES

16"x54" centers Sidney Tritrol 16-speed Grd. Hd., MIL
18"x46" centers American 12-speed Grd. Hd., MIL
20"x94" centers American Grd. Hd., MD
21"x136" centers LeBlond Hvy Duty, Turner drive, taper
24"x51" centers Lodge & Shipley Selec. Grd. Hd., arr MD
24"x60" centers American Hvy Pat 12-speed Grd. Hd., MD, taper
25"x150" centers LeBlond Heavy Duty 16-speed Grd. Hd., MD
No. 608-PV Rivett Precision Toolmaker's, cabinet, equipment, new 1942
11" LeBlond "Rapid Production" H.S. Grd. Hd., 1200 RPM, Timken

PLANERS

30"x30"x8' Gray
36"x36"x16' Cincinnati
36"x36"x18' Gray Extra Heavy Pattern
42"x42"x14' Niles
42"x42"x16' Gray
48"x48"x12' Niles

MISCELLANEOUS

No. 2-A Warner & Swasey Univ. Hollow Hexagon Turret Lathe, MD, Timken, covered ways, 3½" spindle
No. 3-A Warner & Swasey Univ. Hollow Hexagon Turret Lathe, MD
36" Bullard Vertical Turret Lathe, MD, serial 18,000
Bertsch Class "F" Punch & Shear, 1¼" thru 1", 48" throat
20", 24", 28" Gould & Eberhardt High Duty Shapers, MD

Many other machines in stock. Send for stock list.

COX MACHINERY COMPANY, INC.

3 MINUTES FROM THE CINCINNATI HOTEL DISTRICT

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Office&Warehouse 311-313 Bakewell St.,Covington,Ky.

LATE MODEL MACHINE TOOLS . .

AUTOMATICS

No. 61 New Britain, 1⅝" cap. 1942.
2" Cleveland, Model A. 1942.
1-1/16" Cleveland, Model A. 1943.

DRILLS

No. B2A Natco Single Spdl. Latest.
16 Spindle Barnes, Hydraulic. 1942.

DRILLS, SENSITIVE

No. 4B-12 Edlund. 1942.
No. 2B-8 Edlund. 1942.

GEAR EQUIPMENT

No. 6 Gleason Revacycle Generator. 1940.
No. 145A-1 Fellows Gear Shaper. 1943.
No. 72 Fellows Gear Shaper. 1942.
No. 7 L.S. Fellows Gear Lapper. 1944.
Pratt & Whitney Gear Grinder. 1942.
8" Red Wing Internal Shaver. 1942.
15" Red Wing External Lapper. 1942.
Red Wing Univ. Gear Checker. 1942.

GRINDERS, CYLINDRICAL

14"x168" Norton Plain Type C. 1942.
14"x48" Norton Type C Pl. Hyd. 1941.
14"x48" Landis Type C Pl. Hyd. 1943.
10"x36" Cincinnati Plain Hyd. 1942.
10"x18" Landis Type C Pl. Hyd. 1942.
6"x18" Landis Pl. 45° Angle. 1942.

GRINDERS, INTERNAL

No. 24-36 Bryant Hydraulic. 1943.
No. 16 CP 16 Bryant Hydraulic. 1942.
No. 16-16 Bryant Hydraulic. 1942.
No. 122 Heald Hyd. Cap. 1940.
No. 75A Heald, Two Motor. 1943.
No. 72A3 Heald Plain Hyd. 1943.
No. 50 Heald Plain Hydraulic. 1943.
No. 104 Rivett Int. & Ext. 1943.

GRINDERS, SURFACE

14"x36" P & W Vertical Hyd. 1942.
No. 22 Heald Rotary, 12" Chuck. 1943.

GRINDERS, THREAD

No. 33 Excello Thread Grinder. 1943.
No. 31 Excello Thread Grinder. 1941.

GUN BARREL MACHINES

No. ½Bx50 P & W Reamer. Latest.
No. ½Bx30 P & W Reamer. Latest.
No. ½Bx50 P & W Riller. Latest.

LATHES, ENGINE

20"x20' Center LeBlond Heavy Duty. 1941.
18"x60" Reed-Prentice, G.H., M.D.

LATHES, PRODUCTION

No. 3FU Foster Fastermatic Platen. 1942.
No. 4D Potter & Johnston. Late.
No. 3D Gisholt Simplimatic. 1939.
20"x25" Fay Automatic. 1942.
14"x42" Monarch "Magna-Matic." 1941.
10"x12" LeBlond Multi-Cut. Late.
Lipe Carbo-Matic. 1942.
Lipe Carbo Lathe. 1942.

LATHES, TURRET

No. 5 Gisholt Universal. 1942.
No. 4AR Libby Hand Carriage. 1942.
No. 3 Gisholt Universal. 1942.
No. 2 Warner & Swasey Simplified. 1941.

MILLS

No. 2K Milwaukee Univ. 1943.
No. 2L Cincinnati Plain. 1940.
No. 1B Kearney & Trecker, M. D.

MILLS, PRODUCTION

No. 2-20 Kent-Owens Hydraulic. 1942.
No. 14-36 Cinn. Vert. Rail Type. 1944.
No. 3A Sundstrand Copy Mill. 1942.
No. 08 Cincinnati Plain Auto. 1942.

MILLING MACHINES, THREAD

6"x36" Lees-Bradner, Model LT. 1942.

WELDERS

Taylor-Winfield Hi-Wave. 1940.

Write for latest stock list

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1961 S. Meridian St. . . Indianapolis, Indiana

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Knight No. 40 Vertical Mill Equipped for Jig Boring Mfg. 1942

No. 3 Plan-O-Mill Form and Thread Milling Machine. Mfg. 1943.

Brown & Sharpe No. 12 Automatic Mill 18" Table Travel Mfg. 1942

Norton 16"x48" Hydraulic Universal Grinder with Complete Internal Attachment

Norton 6"x30" Semi-Automatic Cyl. Grinder Electric Cycle Controls & Recip. Wheel Mfg. 1943

Brown & Sharpe No. 2 14"x30" Universal Grinder Complete Internal Attach. Mfg. 1942

Lodge & Shipley 3A 20"x27" CC Automatic Lathe Air Cyl. Air Op Tail Stock Front & Rear Slides Mfg. 1943

Cleveland 3¾" Model A Single Spindle, Automatic with Tooling Mfg. 1943

Cinc. 36" Heavy Duty Univ. Shaper With Power Down Feed Mfg. 1943

Gisholt 15 Dynetric Balancer Mfg. 1947.

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1042 W. Lake St. Chicago 7, Ill.

Latest Types — Guaranteed Machine Tools 1941-1951 Models

BROACHING MACHINES

CINCINNATI: 2-36 Vertical Broach, 2 ton, 36" stroke with single broach slide

CAM MILLERS & GRINDERS

VAN NORMAN: Contour Miller 10CT, for milling flat cams and similar work

DRILLING MACHINES

ALLEN: #2 High Speed, 15" overhang
BARNES: 2014¼ 2-spindle on 8-spindle base
BAKER: 217 Upright Heavy Duty, 2" capacity
FOSDICK: No. 48M Upright, High Speed, ⁷⁄₈" drilling capacity, 12" overhang
PROVIDENCE ENG: FV-6 Sensitive 6 motor-driven spindles, ⅜" capacity
PRATT & WHITNEY: ½B x 30 Deep Hole Reaming Machine
ARCHDALE: Radial, all sizes (New)

ENGRAVING MACHINES

DECKEL type—3 dimensional (New)
GORTON: 3U & 3Z, 2 dimensional
GORTON: 3B, 3 dimensional

GEAR CUTTING MACHINES

BARBER-COLMAN: No. 3 Hobber
BROWN & SHARPE: No. 6 Gear Cutter, 72" diameter, 1¼ D.P. capacity
FELLOWS: 61A Shaper, 18" dia. capacity
FELLOWS: 64A Shaper, 18" dia. capacity
FELLOWS: 72 Shaper, 7" dia. capacity
FELLOWS: Straight Line Generator, 3" dia. with many cutters
GLEASON: #12 Rough & Finish Generator
GLEASON: 3" Straight Bevel Gear
HAMILTON: No. 1 Hobber, 8" diameter
SYKES: Gear Shaper 14" external, 20" internal
SYKES: Rack Cutting Machine 24" long (New)

GEAR AND SPLINE GRINDERS

PRATT & WHITNEY: 10" single and double wheel, hydraulic feed
GEAR GRIND MACH: GG-19, 10"x24" Hydr. Spur Gears and Splines, also internal
GLEASON: No. 17 Spiral, Zerol & Hypoid, capacity 23½ P.D.

GEAR FINISHERS & TESTERS

FELLOWS: 8LSI and 18LSI Gear Lappers. External & Internal Spur and Helical
FELLOWS: No. 12-C Spacing Tester
GLEASON: No. 4 and No. 6 Bevel Gear Testers, Hand and Power Operated
GLEASON: 3" Bevel Gear Tester
NATIONAL BROACH: SIC—12" Red Ring Tester

GRINDERS—CYLINDRICAL

BROWN & SHARPE: No. 33, capacity 10"x 48", plain
BROWN & SHARPE: No. 10 capacity 6"x18" plain.
CINCINNATI, 6"x18" Hydraulic, plain
CINCINNATI: 10"x36" Hydraulic, plain
LANDIS: 18"x32" Type "D" Crankpin, Hydraulic, for grinding crankshafts
NORTON: 6"x18" plain, hydraulic
NORTON: 10"x18" plain, hydraulic
NORTON: 10"x18" 45° angle wheel head
VAN NORMAN: #666 Crankshaft Regrinder

GRINDERS—GEAR & SPLINE

PRATT & WHITNEY: 10" single and double wheel, hydraulic feed
GEAR GRIND MACH.: GG-18, 10"x24" Hydr. Spur Gears and Splines, also internal
GLEASON: No. 17 Spiral, Zerol & Hypoid, capacity 23½ P.D.

GRINDERS—INTERNAL

BRYANT: No. 5Y Internal
BRYANT: 112 Universal, Hydraulic
BRYANT: 10C16 Hole, Hydraulic
HEALD: 70A Plain, Internal
HEALD: 72A3 Plain & Univ.
HEALD: 72A5 Plain & Univ.
HEALD: 72A3 Sinematic Centerless
HEALD: 72A5 T-bed, Universal
LANDIS: Hydraulic, 8" stroke x 15" dia.

GRINDERS—RADIUS

VAN NORMAN: #73, capacity 7½" diameter
VAN NORMAN: #639, capacity 7" diameter
VAN NORMAN: #649, capacity 6" to 16" diameter
VAN NORMAN: No. 3½ Universal

GRINDERS—SURFACE

ARTER: A-1—8" Rotary
ARTER: A-3—12" Rotary
HEALD: 8" Rotary
HEALD: No. 22 Rotary—12" Chuck

GRINDERS—THREAD

EXCELLO: No. 31 external, dia. 5"x18" centers
JONES & LAMSON: TG-1245 External, 12" dia. x 45" centers, with additional capacity if required

HONING MACHINES

BARNES: No. 306H Vertical, 24" Stroke
MICROMATIC: H-510 Double End Horizontal
MICROMATIC: H-2 Single End Horizontal, 2-spindle, ¼" to 1" dia. capacity

LAPPING MACHINES

FELLOWS: 8LSI and 18LSI Gear Lappers
NORTON: No. 28 Hyprolaps
NORTON: 2F x 40" Diameter
SCHRANER: Model A External Cylindrical Lapper—4 heads

LATHES—PRODUCTION

LIPE-ROLLWAY: 12"x30" Carbomatic, hydraulic feed
LODGE & SHIPLEY: No. 3A Duomatic
MONARCH: 24"x60" Geared Head
WILLSON: 15"x48" Geared Head Motor Driven (New)
MICHIGAN: #1708
MICHIGAN: #1712 Relieving
PRATT & WHITNEY: 16"x30"
BLOUNT: Polishing speed lathe 12" dia. x 48" centers.

LATHES—TURRET

WARNER & SWASEY: 2A, Saddle Type
GISHOLT: #2L Saddle Type
HERBERT: #8 for chuck work, 20" swing (New 4 machines)
HERBERT: Turret Lathes, all sizes (New)
WEBSTER & BENNETT: Vertical Turret Lathes, 36" and 60" dia. (New)

MILLING MACHINE

CINCINNATI: 2-spindle Vertical Hydrotel with two rotary tables of 36" dia.
SUNDSTRAND: No. 0 Rigidmil
TAYLOR-FENN: M-80 Duplex Spline
RICE-BARTON: Duplex Spline
BRIDGEPORT: Vertical Miller, power feed
TAYLOR-FENN: Vertical 6"x21" table with power feed, high spindle speeds, for toolroom work
VAN NORMAN: Contour Miller 10CT, for milling flat cams and similar work

SAWS & CUT-OFF MACHINES

MOTCH & MERRYWEATHER: No. 0 Circular Saw with auto. stock feed
RUSSELL: 9¼" cut-off Saw with Auto. Stock Feed (New) Hydraulic
CAMPBELL: No. 425 Cutalator Abrasive Cut-Off, 4½" dia. capacity
WILLIAMS: 10" Pipe & Tube Cut-Off

THREAD MILLERS & TAPPERS

HALL PLANETARY: Model "D" Thread
LEES-BRADNER: LT 6"x36" Thread
LEES-BRADNER: 40A Thread Miller
NATCO: Vertical Tapper 16 spindle
PRODUCTO: Hand Tapper
MURCHEY: #22 Horizontal threading and tapping machine, ½" to 2½" dia. capacity

TOOL SHARPENERS

OLIVER: 2A Face Miller Grinder
OLIVER: 10" Tool Bit-Template
FELLOWS: Flat Top Helical Gear Cutter
RANSOM: 2-Wheel Grinder 3 HP
RUSSELL: 40" Saw Sharpener (New), automatic indexing from tooth to tooth

MISCELLANEOUS

CUT-OFF: Campbell, Abrasive 425 Cutalator, 4½" dia. capacity
CUT-OFF: Pipe & Tube, 18" Williams
PRESS: Screw, Gen. Elec. 5 ton
RIVETER: Gen. Engr. 24" throat
TEST STAND: Denison 918-AM Hydraulic
LATHES: Blount Polishing Speed Lathe, 12" dia. x 48" centers
RACK CUTTING MACHINE: Sykes 24" to 36" length capacity (New)
PUNCH SHAPER: Sentinel Shrewbury, Thiel type design (New).

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⅝" No. 204 New Britain 6 spdl.
⅞" Gridley Model G.
1½" Cone 4 spindle
No. 454 New Britain Chucking
14"x19" Fay
14"x18" Monarch Magnamatics

BORING MILLS

84" Gisholt
3" Rockford
4" Detrick & Harvey floor type
No. 5D Moline 6 spdl. cylinder bore

DRILLS

14" Leland Gifford 1, 2 & 4 spdl.
14", 4 spdl Buffalo sensitive
15", No. 2 Avey, 1 & 4 spdl., hydr. feed
16" Sipp, 2 & 3 spindle
24", No. 4B Edlund, power feed
20" & 24" Barnes all geared self oiling
24" Cincinnati
Nos. 121, 217, 310, 315 & 321 Baker
No. 217H Baker horizontal
Barnes horizontal radial
3' Carlton sensitive radial
6'-15" Dreses radial
16 spindle No. 13 Natco multiple
1 & 4 spdl. Avey No. 2, woodpecker feed
7 spdl. Moline horiz. hydr.
12 spdl. Defiance adjustable rail

GEAR CUTTERS

No. 6 Fellows shapers
Nos. 8H, 12H, 16HS, 18H G. & E.
No. 130 Cleveland Rigidhobber
No. 5A Lees Bradner hobber
4" Gleason spiral bevel
Gleason testers & lappers
Illinois involute tester
Red Ring shavers, lappers & speeders
24", No. 3 Adams Farwell hobber

GRINDERS, CYLINDRICAL

10"x18" Norton, plain & semi-auto.
10"x18" Landis hydraulic
10"x24" & 16"x72" Landis mechanical
14"x36" Landis hydraulic universal
10"x18", 10"x30" & 10"x50" Norton mech.

GRINDERS, INTERNAL

No. 75A Heald hand feed
Nos. 72A3 & 72A5 Heald
No. 72A3 Heald, cross sliding, head
No. 72A3 Heald Sizematic
Nos. 16-28 16F28 & 24-36 Bryant
Grenby bench type

GRINDERS, SURFACE

Nos. 10 & 16A2 Blanchard rotary
12" & 16", No. 22 Heald rotary
8" Pratt & Whitney rotary (tub)
14"x36" Pratt & Whitney vertical
8"x24", No. 78 Wilmarth & Morman
14"x48", No. 5 Abrasive

MILLERS

No. 2A Milwaukee
No. 2 Cincinnati, horiz. & vertical
12" Cincinnati Plain Mfg.
18" & 24" Cincinnati plain automatic
No. 4-36 Cincinnati Hydromatic
18", 24" Cincinnati duplex
No. 1-8 Kent Owens hydraulic
Nos. 1, 2 & 3 Kent Owens hand
No. 1 Kent Owens semi-automatic
20"x84" table Ingersoll vertical
Ingersoll Rise & Fall
6 spindle Moline profiler
24"x18"x14' Ingersol planer
48"x24"x22' Ingersoll planer
30" Newton rotary
30", 42" & 84" Ingersoll rotary
No. CT 36 Less Bradner thread
Nos. 4 & 6 Lees Bradner Univ. thread

SHAPERS & PLANERS

24" Queen City Shaper
27" & 34" Morton Draw Cut Shapers
16" Bement Miles slotter
36"x36"x10' Betts planer
48"x48"x14' Woodward planer

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LATE MODEL TOOLS

BORING MILLS

No. 31 LUCAS Horizontal Boring, Drilling & Milling Machine, 3" bar
No. 25RT G. & L. Horizontal Boring, Drilling & Milling Machine
36" and 42" BULLARD Vertical Turret Lathes

LATHES

12"x30" MONARCH Model CK Toolroom
13"x4' bed SOUTH BEND underneath M.D. Precision Lathe
16"x7' bed SOUTH BEND Toolroom Precision
20"x8' AMERICAN Geared Head Lathe

AUTO. LATHES & TURRETS

No. 2 B & O Geared Electric Turret Lathe
No. 5 DE POTTER & JOHNSTON Auto. Tur. Lathe
No. 6S POTTER & JOHNSTON Auto. Turret Lathe

MILLING MACHINES

No. 2HL K&T Plain Miller
No. 26 VAN NORMAN Ray Type Univ. Miller
No. 12M MOREY 2-spindle Vert. Miller & Profiler, 1942
36"x36"x16' INGERSOLL Adjustable Rail Planer Type Miller, 40 HP AC motor drive, One Rail Head, Two Side Heads
No. 08 CINCINNATI Plain & Vert. Auto. Millers

GRINDERS

6"x18" LANDIS TYPE C Plain Grinder
10"x18" LANDIS Type C Plain Grinder
6"x18" NORTON Vert. Spindle Surface Grinder
10"x72" LANDIS Type C Hyd. Pl. Grinder, '42
16"x96" LANDIS Type B Pl. Cyl. with Gap Bed
No. 18/28 BRYANT Hyd. Internal Grinder
No. 174 HEALD Hyd. Gap Internal Grinder
No. 2 NORTON Tool & Cutter Grinder

DRILLS

No. 2LMS LELAND GIFFORD 2-spindle on 4-spindle base
No. 3MS LELAND GIFFORD 2-spindle, hydr. fd.
No. 425 BAKER H.D. Single Spindle Drill

GEAR EQUIPMENT

No. 725A FELLOWS High Speed Gear Shaper
No. 36BM GOULD & EBERHARDT Gear Rougher
No. 12 FELLOWS Gear Shaver

MISCELLANEOUS

15" BETTS Vert. Slotter, M.D.
16" GEMCO Shaper, M.D.
36"x36"x10' CINCINNATI D.H. Planer, 3 heads, M.D.
No. 1½B P & W Two Spindle Reaming Mach., '44
4½"x36" PRATT & WHITNEY Model C Thread Miller
Model H-1 MICROMATIC Hydrohoner
6" TAYLOR & FENN Spline Millers
⅞" CONOMATIC 4-spindle Auto. Screw Mach.
4¾" CONOMATIC 4-spdle. automatic screw machines

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No. 3XA Oilgear Horiz. Hydraulic Broach
No. 3 Barber Colman Gear Hobbers (5)
30" Colburn Vertical Boring Mill
Hanchett No. 221 opposed Disc Grinder
No. 24-26 Bryant Internal Grinder, 1941
4"x12" Landis Type H Grinder, 1940
Model GG36 Geargrind Grinder, 1943
No. 73 Heald Internal Grinder, 1942
6"x30" Cincinnati Hydr. Plain Grinder
Cincinnati Monoset Tool & Cutter Grinder, '42
Detroit Model DH2 Brinell Tester
BL 3620 Pratt & Whitney (Keller) Duplicator (Brand New)
5 D2 Potter & Johnston 2 Spindle Lathe
D-1 Colburn Heavy Duty Drill
Moline 6 Spindle Rail Drills
20"x25" Fay Automatic, 1942
6A Potter & Johnston Turret Lathes
No. 3 Foster Turret Lathe
4FU Foster Fastermatic Turret Lathe
10" Hole Steinle Turret Lathe
No. 6 Warner & Swasey G.H. Turret Lathe
Bridgeport Duplex Automatic Mill—1944
Sundstrand Vertical Mill, rotary table
16" Kearney & Trecker Face Mill Grinder —1942
No. 3S Cincinnati Universal Mill
36A Hanchett Rotary Grinder—1942
No. 1 to 4 Consolidated O.B.I. Presses
No. 304 Bliss Straight Side Press—1942
Erco Model 1002 Riveters 48" Throat—1943
Erco Model 279 Riveters 36" Throat—1943
12" Jones Vertical Shaper (1941)
No. 6 Fellows Gear Shaper
8" Sundstrand Stub Lathe
4A Warner & Swasey Turret Lathe
Model U Lo Swing Lathe, 1942
No. 3 S.S. Leland Gifford Drill

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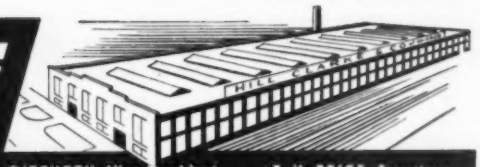

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AUTOMATICS

1-1/16" Model A Cleveland (1942)

DRILLS

2 Spdl—24" Sw—No. 2 Aveymatic
6 Spdl—14" Sw—No. 2 LMS L.G. Hyd.
D-31 Fox Multiple Drill

GEAR MACHINES

No. 12 HS Gould & Eberhardt Hobber
No. 12-H Gould & Eberhardt Hobber
11" Gleason Bevel Gear Generator
No. 1 Whiton Auto. Gear Cutter
No. 6 Gleason Bevel Gear Tester (1942)
No. 36-BM G & E 3 Spdl. Rougher
No. 65 Fellows—Cone Dr.

BORING MACHINES

21" Lucas Hor. Bor. Mill.
Rockford—3⅛" Bar
42" N-B-P Vert. Bor. Mill.
72" Niles—Hvy. Pattern -

GRINDERS

4"x18" Landis, Model 4H
6"x18" Norton Type C Plain (1943)
6"x30" Norton Type C Plain (1943)
10"x36" Norton Type C (1943)
10"x72" Landis Type C Hydraulic
Hill-Clarke Norton Type Motor Driven Grinders
- 10"x36" centers
- 10"x50" centers
- 10"x72" centers
- 10"x96" centers
- 14"x36" centers
- 14"x72" centers
- 16"x120" centers
- 16"-40" gap x 120" centers
- 18"x96" centers
- 18"-30" Gap x 96" centers
- 20"x96" centers
- 24"-32" Gap x 144" centers

26"x72" Norton Crank Shaft Grinder
15"x15"x8' Norton Surf. Gdr.
No. 25-A Heald Surface Grinder
No. 72-A-5 Heald Internal (1942)
No. 16-16 Bryant Internal Grd.
No. 16-28 Bryant Internal Grd.
No. 24-26 Bryant Internal Grd.
No. 81 Heald Centerless Internal
No. 74 Heald Internal Centerless

LATHES

14"x6' Walcott Lathe
19"x8' Le Blond Hvy. Duty Lathe
20"x9' Chard Lathe
36"x18' Putnam Grd. Hd., M.D.
No. 4 Warner & Swasey Tur.-Bar Fd.
No. 5 B & O Tur. Lathe, Cone Hd.
No. 6 Warner & Swasey Tur.-Bar Fd.
2¼"x24" Jones & Lamson
No. 2A Warner & Swasey s.p.d.
No. 3A Warner & Swasey (1941)
20"x8' Fay and Scott
18" Libby Tur. Lathe, M.D.
21" Gisholt, M.D.

MILLING MACHINES

No. 08 Cincinnati Plain
No. 08 Cincinnati Vert.
No. 3 Sundstrand Rigidmil
6"x36" Lees-Bradner — Model LT (1943)
6"x80" Pratt & Whitney Thrd. Mill
6"x132" Pratt & Whitney Thrd. Mill
6"x168" Pratt & Whitney Thrd. Mill
10"x48" Hanson-Whitney Thread (1942)
10"x60" Pratt & Whitney Thrd. Mill

MISCELLANEOUS

No. 151 Besley Dbl. End Disk Gdr.
24" Lutter & Geis Shaper
15" Dill Slotter
18" Dill Slotter
38" Morton Draw-Cut Shaper (1945)
18" Newton Slotter
No. 0 Bakewell Tapper
Baush Radial Tapper
No. 307 Barnes Hone
Model 200 Micromatic Horiz. Hone, 1 Spdl.
Model H-2 Micromatic Horiz. Hone, 2 Spdl.
Model 200—H5 Micro.—Horiz.—2 Spdl.
14' Niles-Bement-Pond Roll
Am. Chip Wringers (New) 3.3 to 12.6 bushel capacity
No. 6 R & K Straight-side Press, M.D.
4-B Marvel Hack Saw
48"-14 Ga. Economy Shear, M.D.
No. 5 Reynolds Power Screw Driver

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36"x36"x12' Cincinnati, 2 hds.
36"x36"x12' Gray, 2 Hds.
42"x42"x10' Cincinnati 2 hds.
48"x36"x14' Gray, 2 hds.
48"x48"x12' Cincinnati; 2 hds.

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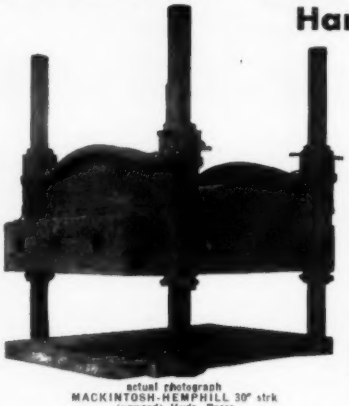

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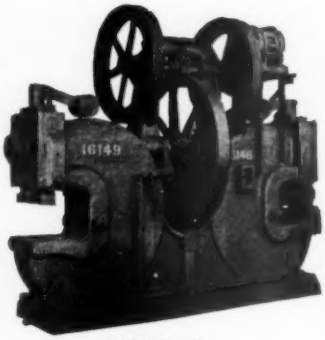
MACKINTOSH-HEMPHILL 30" strk (upward) Hydr. Press

POWER PRESSES

TOLEDO #88, 16" stroke
BETHLEHEM STEEL Hydr. flanging (downward) cap 1200 ton; 66" strk
MACKINTOSH-HEMPHILL hydr. (Upward) 60" stroke; intensifier
BETHLEHEM 16" stroke hydraulic
MACKINTOSH-HEMPHILL 4-post hydr., 24", 36", 60" strokes

PUNCHES—MULTIPLE

SOUTHWARK 400 ton, 7" stroke
WILLIAMS & WHITE, 6" str. Vert.
CLEVELAND #1, 6" stroke
HILLES & JONES #3 Vertical
MASSILLON #5, 60" stroke



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LONG & ALLSTATTER Size B Vertical Punch

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BORING MILL, 100" Cinci. Massive, 2 Hds., M.D.
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GEAR SHAPER, No. 75 Fellows High Speed
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GRINDER, No. 16Y28 Bryant, Int., 1943
GRINDER, No. 174 Heald Gap, Int., 54" sw., '42
GRINDER, No. 72A3 Heald Internal Pl., '42
GRINDER, No. 72A5 Heald Internal, 1943
GRINDER, Micro-Internal, Large
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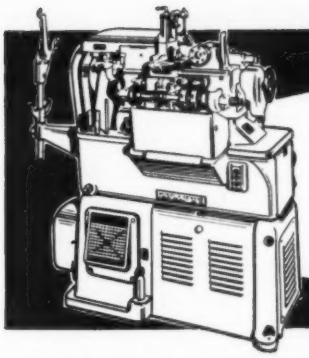

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#61A Fellows Gear Shaper
#1A Warner & Swasey Turret Lathe
#30 Waterbury Farrell Thread Rollers
#0 Brown & Sharpe Automatic Screw Machines with Turner Drives
#2 Barber Coleman Hobbing Machine
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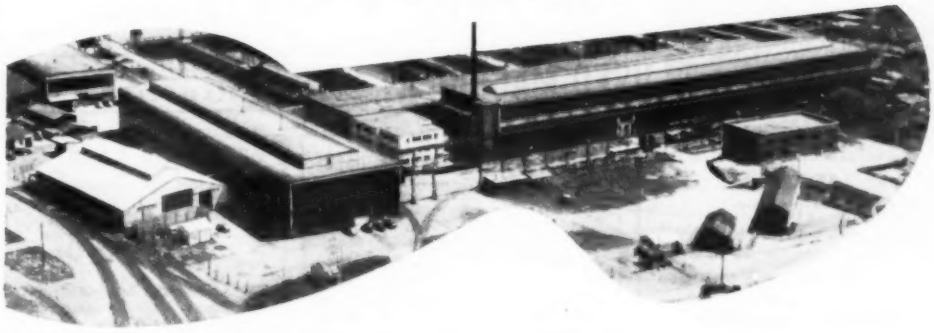

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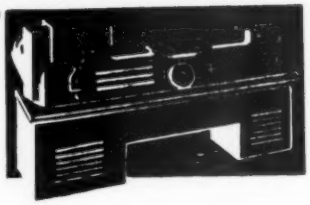

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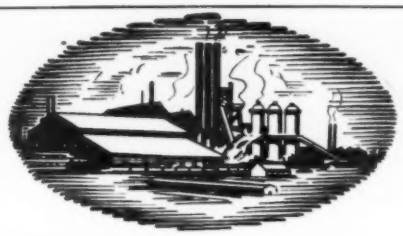

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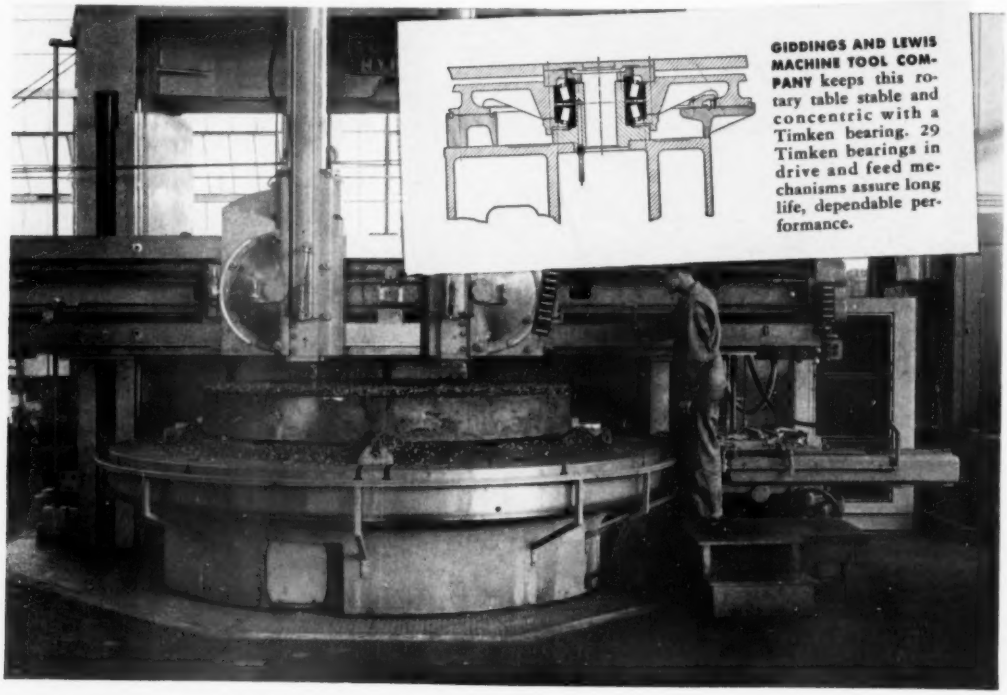
Timken tapered roller bearings take radial and thrust loads in any combination. Shafts are held in positive alignment with no deflection. Gears mesh accurately and wear on moving parts is kept to a minimum. Line contact between the rollers and races gives Timken bearings extra load-carrying capacity.

Timken tapered roller bearings are precision products throughout. Rollers and races are made of Timken fine alloy steel for toughness, then case-hardened for exceptional resistance to wear. True rolling motion and the incredibly smooth surface finish result in virtually friction-free operation. And because Timken bearings permit tighter closures, lubrication time and material costs are greatly reduced.

For over half a century, Timken bearings have been first choice throughout industry. If you build machine tools, specify Timken bearings. And if you buy new equipment, look for the trade-mark "Timken" on the bearings. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



GIDDINGS AND LEWIS MACHINE TOOL COMPANY keeps this rotary table stable and concentric with a Timken bearing. 29 Timken bearings in drive and feed mechanisms assure long life, dependable performance.

DESIGN LEADERSHIP

The first Timken tapered roller bearing was produced in 1898. Since then the one-piece multiple perforated cage, wide area contact between roll ends and ribs, and every other important tapered roller bearing improvement have been introduced by The Timken Roller Bearing Company.

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